WORKING PAPER

Deep Trade Agreements, Institutions and Global Value Chains: Evidence from Egypt

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Abstract

This paper investigates the nexus between deep trade agreements, institutional quality and global value chains (GVCs) in Egypt. In reality, the enforcement of deep trade agreements requires good institutions, in order to boost GVCs. Applying a Poisson Pseudo-Maximum Likelihood (PPML) estimator to control for heteroscedasticity and zero trade flows, we use bilateral and sectoral data on Foreign Value-Added (FVA) exported by Egypt from the Eora dataset and merge it with the Deep Trade Agreement Dataset (World Bank). The findings of the paper support the positive relationship between the depth of trade agreements and GVCs at the aggregated level. In addition, differences in the quality of institutions reduced this positive effect. However, the sectoral analysis revealed much heterogeneity across different sectors. Comparing the coefficients of trade agreements for different periods, one can conclude that GVC linkages in human capital and technology-intensive products have started to respond to deep trade agreements, pointing towards agreement depth being highly relevant in respect of export upgrading. From a policy perspective, this paper highlights the importance of deepening agreements if the participation of African countries in GVCs, including Egypt, is to be increased.

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1   Introduction

Global value chains (GVCs) have become a dominant feature in world trade at both the firm and the country levels. Given that fragmentation of the production process results in an increase in trade between countries, the reduction of different forms of trade barriers is crucial for promoting GVCs. As trade agreements usually contain provisions that tackle the reduction of tariff and non-tariff measures, they would be essential in promoting GVCs amongst their signatories. However, not all trade agreements have been proven effective in this respect. Whilst ASEAN members were able to increase their participation in GVCs, MERCOSUR failed to promote them amongst its members (Antras, 2020). One of the potential reasons behind this disparity is the depth of agreements. Indeed, Hofmann et al (2017) shed light on the importance of trade agreement content, providing information on more than 250 preferential trade agreements (PTAs) that were signed between 1958 and 2015. They reveal data on the policy areas covered by each agreement and the extent of the legal enforcement of these provisions. In the same vein, Mattoo et al (2020) suggest another method of calculation for depth, which they applied to 283 PTAs signed between 1958 and 2017. Hence, this paper examines how deep trade agreements can affect GVC participation.

GVCs are associated with substantial gains at both macro and micro levels. Cigna et al. (2022) show that, amongst other benefits, GVC participation facilitates technological transfer between European countries. Nevertheless, the positive impact of GVC participation on economies is not exclusive to high-income level countries. Indeed, Del Prete et al. (2017) demonstrate that North African firms participating in GVCs are able to increase their productivity. At trade policy level, several studies focused on determining the role of trade agreements in encouraging this type of participation. For instance, Johnson and Noguera (2017) test the relationship between the ratio of value-added to gross exports and the presence of trade agreements. They found a negative and significant relationship that links the two variables. However, they did not take into consideration the depth of trade agreements, even though this variable might affect GVCs (Shingal, 2016), or the heterogeneous impact on different goods (Tokas, 2022). This was remedied by Laget et al (2020). They tested for the relationship between GVCs and deep trade agreements using data from 260 agreements. They were able to conclude that the more areas the trade agreement covers, the greater the positive effect on backward and forward linkages.

Yet, the literature neglected the moderating role of institutional quality when considering the effect of deep trade agreements on GVC integration. Whilst institutions matter generally for trade (Meon and Sekat, 2018; Osnago et al., 2019 and Karam and Zaki, 2019), the enforcement of deep trade agreements might be

sensitive to the quality of a country's institutions (Guillin et al, 2023). Thus, this paper aims to test to what extent deep trade agreements have a role in shaping GVC linkages, taking the quality of institutions into account. We use data from Egypt to illustrate these channels. The Egyptian case is of particular interest, given that Egypt is trying to boost its exports and increase them threefold, as was announced in 2019 (Giovannetti et al., 2020). In addition, the country is trying to attract more foreign direct investment (FDI) and to participate in GVCs. This could result in upgrading the role of Egypt in the global supply chain, so that it specialises in higher end value chains - instead of limiting its role to the supply of primary products – thereby achieving a step towards development. Yet, most of the trade agreements Egypt has signed are limited to tariff removal.

To examine this question, the Poisson-Pseudo Maximum Likelihood (PPML) model is used. Following the structural gravity model, proposed by Laget et al (2020), we combine data from the Deep Trade Agreements datasets provided by the World Bank to measure depth of trade agreements, from the UNCTAD-Eora database to measure Foreign Value-Added (FVA) in exports (as a measure of backward linkages) at the sectoral level and from the World Governance Indicators (WGI) for institutions. Whilst the domestic value-added is higher than the share of foreign value-added in Egypt, it is important to analyse the determinants of the latter, as it measures backward linkages. Generally, firms enter the GVC through backward linkages that can represent an opportunity for learning-by-participation in the GVC (Mehta, 2022). Indeed, backward linkages can be associated with technology transfer and a reduced cost of intermediate inputs, which improve the competitiveness of exports. We also analyse the heterogeneous effect of deep trade agreements on different products. Our findings support the positive relationship existing between deep trade agreements and GVCs. In addition, the difference in the quality of institutions reduced this positive effect. As for the sectoral analysis, we find that linkages in primary and unskilled labour intensive products are the most affected by trade agreements, which are sectors where Egypt has a comparative advantage. However, comparing the coefficients of trade agreements for different periods, one can conclude that GVC linkages in human capital and technology-intensive products have started to respond to deep trade agreements, pointing towards the agreement depth playing an important part in export upgrading.

The rest of the paper is organised as follows. Section 2 presents a brief review of the literature; section 3 shows certain descriptive statistics relating to the main variables of interest; section 4 explains the methodology; section 5 is dedicated to the results; and. finally section 6 concludes and provides some policy insights.

2 Literature Review

The literature on the relationship between different types of trade agreements and trade is abundant. Early studies (Viner, 1950 and Lawrence, 1996) analyse different agreements that came into force, in order to assess their effect on trade. Whilst Viner (1950) focus on customs union, Lawrence (1996) focuses on the heterogeneity of trade agreements, comparing the NAFTA to the Canada-USA agreement. Moreover, the author briefly mentions the rise of global value chains whilst studying the case of Asian countries during the 1980s. In this respect, he points out the important role of Asian integration, since it allows low price intermediate goods to be sold on the world market.

At the theoretical level, different models can be divided into two types: those examining the effect of GVCs on the probability of concluding trade agreements, such as Antràs & Staiger (2012), and others presenting the effect of trade agreements on GVCs, such as Bickwit, Omelas and Turner (2018). Antràs and Stagier (2012) develop a model that explains the effect of offshoring on trade agreements. Taking into account the incomplete nature of contracts and assuming that trade in intermediates is customised for the receiving countries, they prove that offshoring creates the need for deeper trade agreements. The authors suggest that the complication created by the fragmentation of the production process amongst different countries, makes it hard for governments to rely on "simple rules" in their trade policies. Thus, offshoring increases the demand for deeper agreements, in order to tackle detailed issues related to specific products and to secure contracts that are more complete, which reduces uncertainty. On the other hand, the second strand of the literature focuses on the impact of agreements on trade in general and GVCs in particular. A theoretical framework for this is developed by Bickwit, Omelas and Turner (2018) who develop a model that allows one to study the effect of preferential trade agreements (PTAs) on international outsourcing, the productivity of the country and welfare. They assume the existence of vertical chains between firms in different countries where suppliers provide customised input for each buyer. Hence, in a world of incomplete contracts, the specificity of the traded input is accompanied by hold-up problems. This type of problem increases the risk for investors and, thus, leads to under-investment. Therefore, trade agreements, including deep provisions on competition and investment, provide possible solutions to the under-investment problem. They also focus on the provision of intellectual property rights, which ought to increase investments and trade in customised inputs. The model shows that the aforementioned effect only prevails in cases where many inefficiencies exist in the market before the conclusion of the agreement. In other words, if the country suffers from serious under-investment, deeper provisions remedy the existing inefficiencies. However, countries with strong institutions protecting intellectual properties are not

going to benefit from deeper IPR provisions. Thus, according to the model, developing countries are, in general, the main beneficiaries of deep trade agreements.

Empirical papers that study the effect of trade agreements on trade rely chiefly on the structural gravity equation with multilateral resistance terms, developed by Anderson and Van Wincoop (2003). Yet, a major problem resides in the choice of the variable presenting PTAs. Including a dummy variable. marking the existence of a PTA between the two countries in a certain year, is not an optimal choice, as Shingal (2016) shows. The author attempts to study the effect of service trade agreements (STAs) on service trade, using a depth variable ranging from 0 to 8 instead of a dummy variable. His results show that when using a more disaggregated measure of depth, the effect of STAs on bilateral service exports becomes lower and, in some cases, insignificant. The previous results are supported by Kohl (2014) and Kohl et al. (2016), who study the heterogeneity of trade agreements. Whilst the former includes an individual test for 166 trade agreements concluding that only 27% were trade promoting, thanks to more policy areas covered in the agreement, the latter take a further step to analyse the heterogeneity between provisions covered by trade agreements. The authors argue that provisions falling under the WTO mandate (WTO+) and other provisions (WTO-X) affect trade differently. Thus, they define 17 policy areas that include 13 policy areas that fall under the WTO mandate. Their argument is supported by the results of an OLS regression they conducted on 221 countries from 1948 to 2011. Results show that - unlike WTO-X provisions - WTO+ provisions are most likely to be legally enforceable, which leads to a positive impact on trade. Hence, the number and the type of policy areas covered by the PTAs are crucial in understanding the prevailing effects on trade.

In addition to that, depth is an important factor to take into account when studying the channels through which PTAs affect trade. Following the idea of Viner (1950), Mattoo et al (2017) provide an empirical test, in order to assess the effect of deep trade agreements in terms of trade creation and trade diversion. Their analysis was conducted on 96 countries between 2002 and 2014, concluding that deepening trade agreements leads to trade creation and not trade diversion; deep trade agreements do not negatively affect trade with non-members. This result could be explained by the non-discriminatory provisions included in deep agreements, such as reducing subsidies or competition policy reforms.

Other studies focus on the effect of trade agreements on the participation in global value chains (GVCs). Even though all these studies used the same measures for the depth of trade agreements (dummy variables, number of provisions or measures based on the principal component analysis (PCA)), different measures were used to proxy GVCs. For instance, Osnago et al. (2017) and Osnago et al. (2019) used firm level data to calculate vertical FDI flows and the WTO dataset to obtain data on trade agreements for the period between 1987 and 2011. To account for endogeneity, they

use an instrumental variable approach including terms capturing the average depth of trade agreements between the countries in question and third-party countries. Results show that deep trade agreements (measured by a dummy variable or number of provisions included or using the PCA) are associated with increased FDI vertical flows, especially those originating from the USA, Germany and Japan (Osnago et al, 2017). Furthermore, they distinguish two types of provisions that they call "provisions improving the contractability of components" and "provisions improving the contractability of headquarter services". Results show that the first type of provisions is associated with an increase of FDI flows, whilst the second one is associated with a decrease in FDI flows (Osnago et al, 2019). These results hold when the dependent variable measures the intensive margins of trade but are less significant for the extensive margins of trade.

Other than vertical FDI integration, other papers measure GVCs by gross trade in parts and components. Orefice and Rocha (2014) conducted analysis on 200 countries between 1980 and 2007. They include a term in the gravity model that accounts for the depth of trade agreements measured by the PCA alongside other control variables, such as tariffs, multilateral resistance terms, and distance. The model is then replicated at the sectoral level. Main results support the existence of a positive relationship between the depth of PTAs and trade in parts and components, especially for capital-intensive goods. For instance, a 1% increase in the depth of the PTAs is associated with a 36% increase in trade in automotive parts but had no effect on trade in textiles. This is attributed to the fact that capital-intensive sectors - by their nature – in order to develop, require strong regulation in IPR and capital movement. Other measures, like trade in intermediate goods, led to the same conclusion. Tokas (2022) argues, whilst comparing automotive and basic metals sectors, that the s characteristics, such as the degree of innovation and higher product differentiation, are important to account for in the analysis. To compare the results, the author applied the PPML estimation for data on 64 countries from 2000 to 2015 using gross exports and exports of intermediate goods. He found that trade in intermediate goods appeared to be more affected than gross exports by deeper PTAs. Even though this paper uses a closer proxy for GVCs and recent data, no developing countries were included in the sample. Thus, conclusions cannot be generalised at the global level.

The fourth and last measure that has been wildly used recently in the analysis of GVCs is value-added exports (VA exports). Johnson and Noguera (2017) conduct the analysis on a smaller yet more diversified sample of 42 countries, compared to Tokas (2022), over four decades (from 1970 to 2009). For trade agreements, they use dummies to differentiate between PTAs, FTAs and custom unions, common markets and economic unions, as a measure of depth. Authors also use phase-in effect to capture the effect of trade agreements in the long run. In other words, they introduce

a set of dummy variables representing the trade agreement in question five, ten, and fifteen years hence, following it coming into force. The dependent variable is defined as the ratio of value-added exports to gross exports. Estimated coefficients are negative, implying that trade agreements reduce the value-added to gross exports ratio. Authors conclude that the spread of regional trade agreements is responsible for 15% of the decline in the aforementioned ratio; trade agreements affect gross exports more than VA exports. These findings contradict Tokas (2022), who supports the idea that the effect of trade agreements is stronger on VA exports.

Combining the approaches of Tokas (2022) and Johnson and Noguera (2017), Laget et al (2020) use domestic and foreign value-added in intermediates in the analysis carried out across 180 countries from 1958 to 2015. The results from the PPML estimation show a positive effect of deep trade agreements on GVCs, as each additional policy area increases domestic and foreign value-added in intermediates by 0.48% and 0.38% on average. Respectively, by conducting sectoral regressions, it appears that sectors with high value-added (typically services) are those who benefit more from deeper trade agreements in terms of GVC integration.

In summary, the main findings of the literature show that the majority of studies found a positive relationship between trade agreements and GVCs, even when using different definitions for both variables. However, endogeneity issues need to be addressed, in order to avoid an overestimation of the effect of deep agreements on GVCs. In addition, the effect of trade agreements is heterogeneous across countries (developed vs developing) and across sectors (capital-intensive vs labour-intensive and high value-added sectors vs low value-added ones).

Set against this literature, our paper bridges the gap between two strands of the literature, namely the effect of trade agreements on GVCs and of institutions on trade. Thus, we test to what extent deep trade agreements have a role in shaping GVC linkages, taking the quality of institutions into account. We use data from Egypt to illustrate these channels, as an example of an emerging economy that is still not sufficiently integrated in GVCs but has many trade agreements along with strong potential (thanks to its proximity to main markets, labour abundance, etc.).

3   Data and Stylised Facts

As mentioned previously, this study aims to investigate the relationship between deep trade agreements and GVC participation, whilst accounting for the quality of institutions. In order to reach this goal, data on the FVA of 190 countries for 26 exporting sectors has been retrieved from the UNCTAD-Eora database. The dataset covers FVA in thousands of USD, for the period extending from 1990 to 2017. Whilst the domestic value-added is higher than the share of the foreign value-added

in Egypt (see Figure 1), we examine the determinants of the latter. Generally, firms enter the GVC through backward linkage, which could represent an opportunity for learning-by-participation in a GVC (Mehta, 2022). Indeed, backward linkages can be associated with technology transfer and a reduced cost of intermediate inputs, which will improve the competitiveness of exports.

Figure 1: Egypt's Foreign and Domestic Value-Added
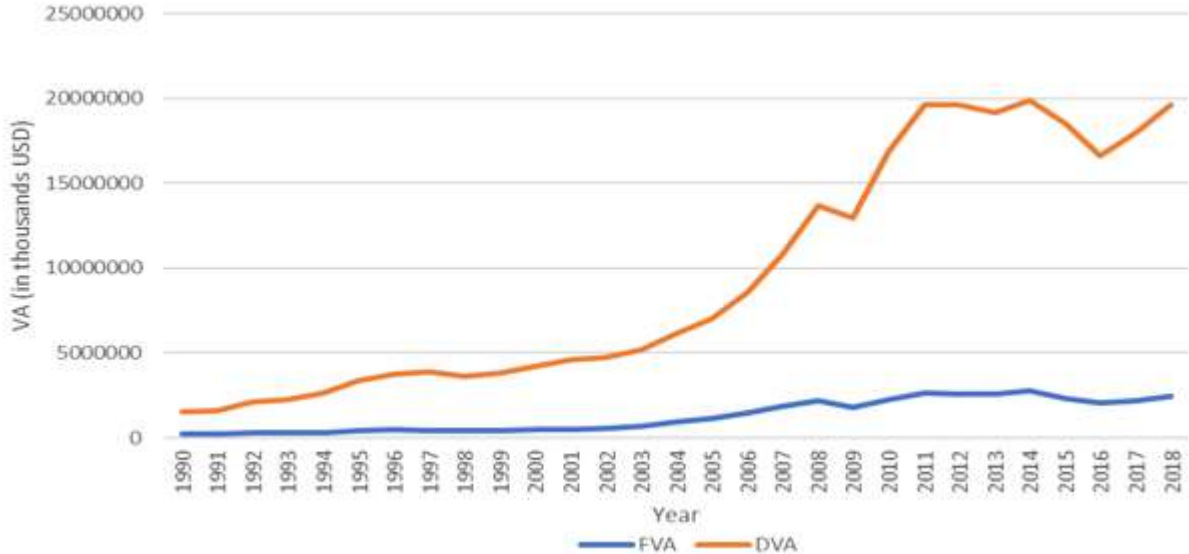
Source: UNCTAD-EORA dataset
Note: FVA stands for foreign value-added and DVA for domestic value-added.

As for the depth of trade agreements, two datasets are used: the dataset of Mattoo et al (2020) for vertical depth and that of Hofmann et al (2017). Mainly, The vertical depth will mainly be used as - unlike horizontal depth - it accounts for more than just the number of provisions covered by the agreement in question.

On its road towards liberalisation, Egypt joined the World Trade Organization (WTO) in 1995. In addition to that, Egypt is also a partner in 10 regional trade agreements that were notified to the WTO. Furthermore, as a developing country, Egypt benefits from reduced tariffs as a beneficiary of the Generalised System of Preferences[3] of nine countries. However, in the following analysis, the number of trade agreements in which Egypt is engaged will not be of much interest. The focus

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[3] The Generalised System of Preferences (GSP) consists of reducing tariffs on imports originating from developing countries. The aim is to provide them with access to the world market. It should be noted that fifteen countries adopt the GSP of the USA, UK and Russia.

would be on the depth of trade agreements, as this offers a better understanding of the content of the agreement.

Accounting for the depth of trade agreements allows for the examination of other forms of integration, such as movement of capital, labour market regulations and intellectual property rights. Mattoo et al (2020) present Deep Trade Agreements (DTAs) as agreements that aim to achieve the *"free movement of goods, services, capital, people and ideas."* Hofmann et al. (2017) identify 52 policy areas that could be covered in trade agrements. For each agreement, a value of 1 is attributed for all the policy areas that are covered. Hence, this dataset presents the horizontal depth, as it only captures whether a certain agreement covers the policy areas or not, with no measure of the efforts made to increase the enforcability or the commitment of partners in a certain provision. The dataset covers 279 agreements between 1990 and 2015. For Egypt, the deepest agreement appears to be the EU-Egypt Association Agreement, which covers 36 policy areas. Figure 2 shows the evolution of the depth of trade agreements measured by the average number of covered provisions in each agreement, for 71 countries. Obviously, trade agreements signed with developed countries are deeper, with an average of 33 provisions per agreement, whilst those signed with developing countries cover 19 provisions on average. This study also relies on bilateral data capturing vertical depth retrieved from the World Bank, based on Mattoo et al (2020), who apply their methodology on 18 policy areas (out of 52), which are included in the majority of the agreements. This database includes a larger set of countries, presenting the provisions covered by the agreements between Egypt and 101 countries.

Figure 2: Average Depth of Egypt's Trade Agreements
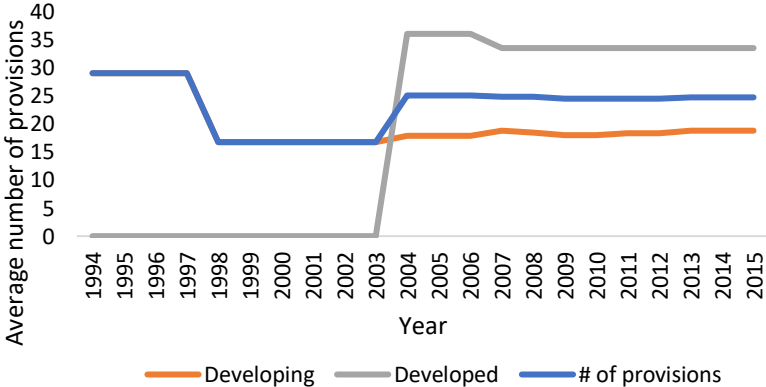
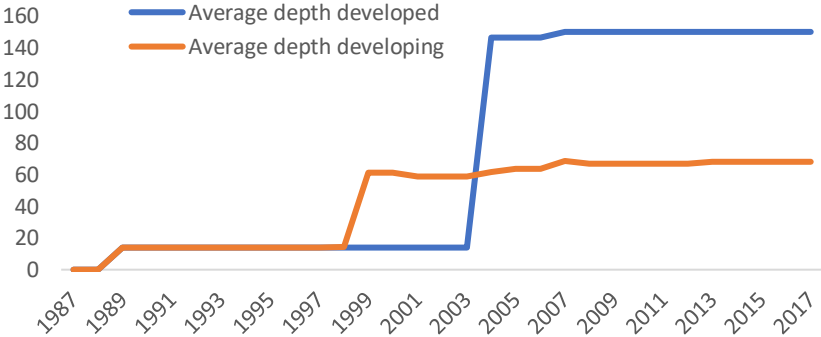**Source**: Constructed by the Author using Hofmann et al (2017) database, available on the World Bank website

Egypt concluded its first agreement in 1989 with the Global System of Trade Preferences amongst Developing Countries, which was signed by 43 countries. Following that, Egypt signed the Pan Arab Free Trade Area (PAFTA) and accessed the Common Market for Eastern and Southern Africa (COMESA) in 1998 and 1999

respectively. More Free Trade Agreements (FTAs) were signed with the EU, EFTA, and MERCOSUR between 2004 and 2017. The latest agreement was concluded between the UK and Egypt in 2021 but, unfortunately, it is not mapped in the aforementioned datasets.

However, agreements concluded with developed countries are, on average, two times deeper than those concluded with developing countries when considering vertical depth (Figure 3), as calculated by Mattoo et al (2020). It should be noted that vertical depth accounts for more criteria in the assessment of the depth of a certain provision, rather than just giving a value of 1 for provisions covered by the agreement, like Hofmann et al (2017). It is clear that the difference between trade agreements with developing and developed countries becomes more pronounced when using additional criteria to assess the coverage of each policy area. This observation is consistent with the findings of other papers, such as Mattoo et al (2020) and Hofmann et al (2019). North-South trade agreements tend to be significantly deeper than South-South trade agreements. The authors attribute this to the differences in the quality of institutions between developed and developing countries. As the former have greater institutional capacities, they are able to negotiate and implement deeper provisions related to competition laws and services (Mattoo et al, 2020).

Figure 3: Vertical Depth of Trade Agreements

Source: Constructed by Author using Mattoo et al (2020) database, available on the World Bank website

Regardless of the method used to assess deep trade agreements, the latter are proven to be trade enhancing, with minimal trade diversion effects (Mattoo et al, 2020). However, the light has mainly been shed on value-added exports rather than

total exports. The UNCTAD-Eora database is used to measure GVCs[4] by Foreign Value-Added content in exports (FVA)[5]. The data maps FVA for 189 countries between 1990 and 2018. As Figure 4 shows, FVA has been increasing for the past three decades, except for short periods of instability. This includes the financial crisis in 2008 and the extended period between 2011 and 2016, which was characterised by political instability and the implementation of new reforms in Egypt.

One can observe that regarding Egyptian exports (Figure 4), the average VA originating from developing countries exceeds the VA originating from developed countries. In addition, the average FVA of developing countries is growing faster than the average FVA of developed countries. This would appear to be an unexpected result since, as mentioned previously, trade agreements between Egypt and developed countries are deeper and, thus, one should expect this to reflect positively on the GVCs. Nevertheless, this result could be logical if one accounts for differences in institutions, since gaps in institutional quality could be responsible for reducing the effectiveness of deep agreements. Thus, even with deeper agreements, the effect on GVCs could be reduced, due to the institutional gap that exists between Egypt and developed countries. This hypothesis is to be tested throughout this paper. In addition, the increase in GVC participation since the 1990s has been hindered by the 2008 financial crisis. At the regional level, especially in the EU and Asia, the majority of supply chains are intra-regional, which reduces the supply linkages with countries outside the region (Cigna, Gunnella and Quaglietti, 2022). In contrast, participation in value chains (either backward or forward) is mainly extra-regional for developing countries, except for the Southeast Asia region (Kowalski, Gonzalez and Ugarte, 2015).

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[4] According to the OECD, GVCs could be defined as the fragmentation of "different stages of the production process, across different countries."

[5] According to the WTO, Foreign value-added content of exports is defined as "the value-added of inputs that were imported in order to produce intermediate or final goods/services to be exported."

**Figure 4: Average FVA in Egyptian Exports (in thousands USD)**
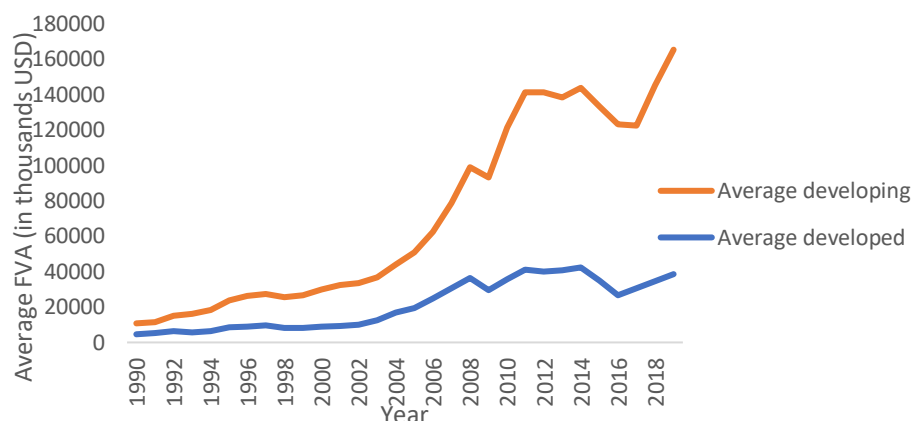
Source: Constructed by the authors using UNCTAD-Eora database

Whilst GVCs are determined by many factors such as geography, political stability and GDP per capita, trade agreements (either bilateral or regional) appear to be a key determinant of GVCs (Fernandes, Kee and Winkler, 2020). In order to assess this relationship, we focus on the vertical depth of agreements. The distinction between shallow and deep agreements is based on the median of the depth variable for countries which have a trade agreement with Egypt. Thus, an agreement for which the value of depth is lower (higher) than the median depth is considered a shallow (deep) agreement. Thus, this variable takes a value of 0 if there is no agreement between Egypt and the country in question in a certain year; 1 if a shallow agreement is in force; and 2 if a deep agreement is in force. Comparing the three categories[6], one can observe that the average FVA is highest for countries signing deep trade agreements with Egypt (Figure 5.A). However, it seems that shallow agreements do not affect the FVA. This is observed for the two measures of depth, whereas the average FVA of countries signing shallow agreeements with Egypt does not seem to differ from the average FVA of non signatories. Given that the average is affected by outlier values, the categories of depth are compared with the median of FVA. Although the highest FVA is still associated with deep trade agreements, larger FVA is now observed for shallow agreements, compared to countries with no trade agreements (Figure 5.B). This suggests that concluding trade agreements - whether shallow or deep - is associated with high GVC participation.

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[6] In this section, all figures represent categories of vertical depth. All figures are replicated for categories of horizontal depth and are available in the appendix (Figures A.1-4)

Figure 5: FVA by Categories of Vertical Depth
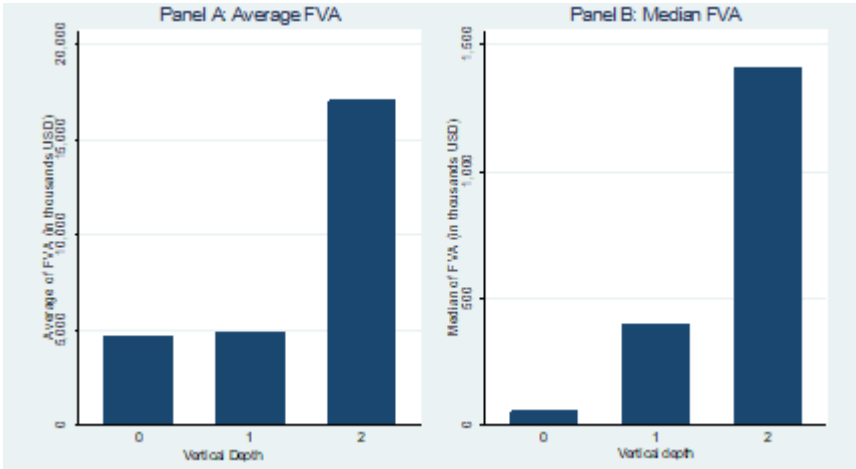
Source: Constructed by the authors using Mattoo et al. (2020 database)

These conclusions may vary according to the type of exports in question. For instance, by classifying exports into products and services, one can observe that the average and median FVA is higher for products (Figure 6). This observation applies for all the categories of depth - regardless of the depth variable (whether horizontal or vertical). Therefore, one can say that Egyptian participation in the services value chains remains weak, compared to products, even with partners signing the deepest agreements.

Figure 6: Median FVA in Products vs. Services by Categories of Vertical Depth
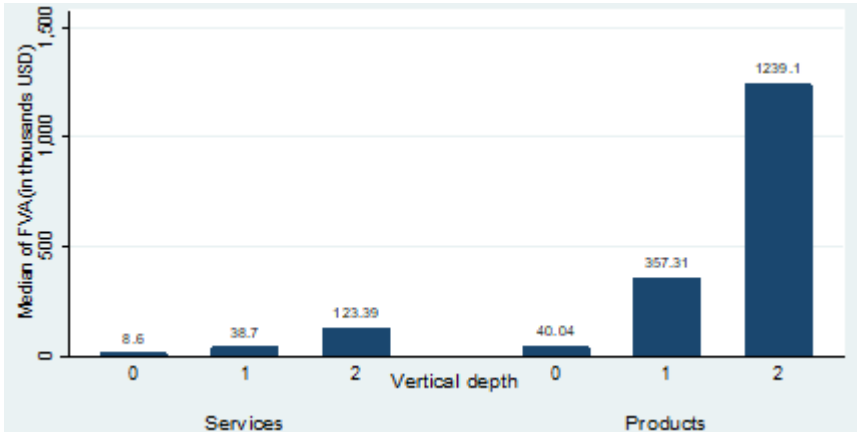
Source: Constructed by the authors using Mattoo et al. (2020 database)

Since neither products nor services are internally homogenous, the literature suggests that trade in various types of products/services react differently to deep trade agreements. Dividing products and services by factor intensity, the relationship between depth and each of the factor intensity categories is presented graphically.

Unlike Tokas (2022) and Laget et al (2020) suggest, it is observed that the primary products and unskilled-labour intensive products have the highest median FVA amongst all products (Figure 7). In order to establish a better understanding of these results, the ratio of the median FVA for deep trade agreements to shallow ones is referred to[7]. It is found that this ratio is highest for primary and natural-resourse intensive products (taking values of 3.6 and 3.5 respectively) and is lowest for human-capital intensive products with a value of 2.6. This result is in line with the sectors where Egypt has a comparative advantage.

Figure 7: Median FVA and Vertical Depth by Factor Intensity (Products)
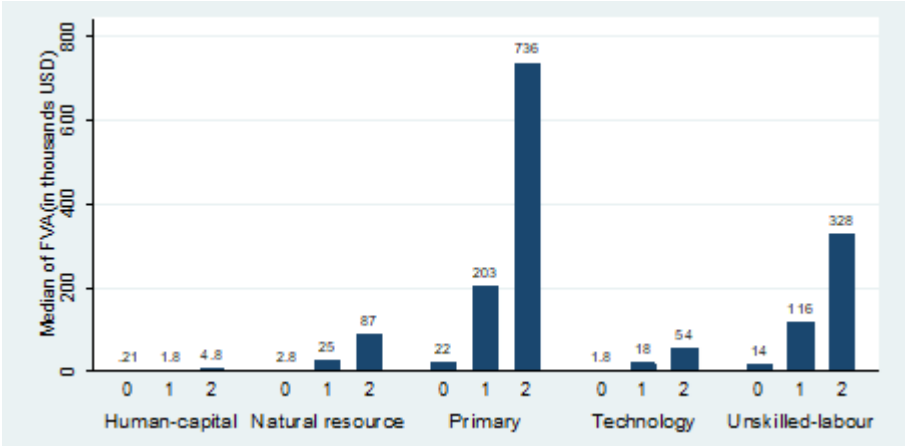

Source: Constructed by the authors using Mattoo et al. (2020 database)

As for services, the same observation applies where unskilled-labour intensive services have a higher median FVA when compared to human-capital intensive services for all depth categories (Figure 8). However, the ratio of median FVA for deep trade agreements, compared to shallow ones, is higher for human-capital intensive services with a value of 3.5, compared to 3 for unskilled-labour intensive services. This means that FVA in Egyptian exports of human-capital intensive services is more affected by a shift from shallow to deep trade agreements, compared to unskilled-labour intensive services.

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[7] This ratio allows one to compare the FVA for deep and shallow agreements for a certain sector, which gives an insight into the extent to which the effect of the former differs from the latter.

Figure 8: Median FVA and Vertical Depth by Factor Intensity (Services)
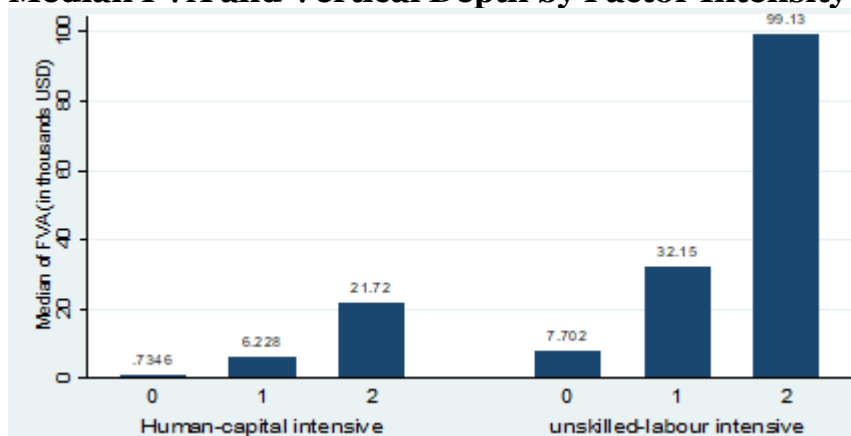
Source: Constructed by the authors using Mattoo et al. (2020 database)

Besides trade agreements, the quality of institutions is one of the determinants of trade in general and GVCs in particular. Recent studies examine the effect of the institutional gap rather than the quality of the institutions of the exporter and the importer (Álvarez et al, 2018; Karam and Zaki, 2019). This section revealed the existing positive relationship between the depth of trade agreement and global value chains measured by FVA in exports. The heterogeneity of exports was examined by classifying them according to their type (products vs services) and their factor intensity.

4 Methodology

In order to examine the nexus between GVCs, institutions and the depth of trade agreements, we estimate the following equation:

$$FVA_{its} = exp\{\beta_0 + \beta_1 depth_{it} + \beta_2 diff\_institution_{it} + \beta_3 \ln(gdp\_o_{it}) + \beta_4 \ln(gdp\_d_t) + \beta_5 \ln(dist_i) + \beta_6 contig_i + \beta_6 com\_lang\_ethno_i + \beta_7 col\_dep\_ever_i + \varepsilon_s\} + \mu_{its}$$

where the dependent variable is the VA (measured in thousands USD) originating from country i in year t and embedded in the Egyptian exports of sector s. As for the independent variables, *depth* is the variable measuring the depth of trade agreement between Egypt and country i in year t. It takes three possible values: 0 if no trade agreement exists between Egypt and the concerned country in a certain year[8]; 1 for shallow trade agreements; and 2 for deep trade agreements. The same method is

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[8] Data on countries involved in a trade agreement with Egypt are retrieved from the WTO website.

applied for horizontal and vertical depth. The second main independent variable is *diff_institution*. This is measured by the absolute difference between the quality of institutions of the exporter and the importer. The quality of institutions is retrieved from the World Governance Indicators (WGI) database. Three measures are relevant to this study: control of corruption; government effectiveness; and rule of law, according to Álvarez et al (2018). Moreover, the arithmetic mean of the aforementioned indicators is calculated and used as a measure of institutional quality. Instead of using the quality of institutions of the countries originating the VA exported by Egypt, the institutional gap between the country in question and Egypt is used. This gap is calculated as the absolute difference between the quality of institutions in Egypt and that of the other country. The usage of such a measure is motivated by Karam and Zaki (2019) and Álvarez et al (2018), as they show that the institutional gap has a more pronounced effect on trade compared to quality levels of institutions in the MENA countries. Unfortunately, the data on quality of institutions has only been available since 1995. Consequently, the analysis starts with data from 1995 onwards, instead of 1990. Finally, since the data is unavailable for all countries in 1995, 1997, 1999 and 2001, the data for each of these years is replaced by the value of the following year.

As for the rest of the variables, *ln(gdp_o)* and *ln(gdp_d)* are the natural logarithms of the GDP of country *i* in year *t* and that of Egypt in year *t*; *ln(dist)* is the natural logarithm distance between country *i*'s capital and Cairo. *Contig* is a dummy variable taking the value of 1 if country *i* shares common borders with Egypt. *Com_lang_ethno* is a dummy taking the value of 1 if country *i* and Egypt share a language that is spoken by at least 9% of both populations. *Col_dep_ever* is a dummy that takes the value of 1 if country *i* and Egypt were in a colonial relationship. Finally, ε represents sectoral fixed effects and μ is the error term. Gravity variables come from the CEPII dataset.

As the model is non-linear, the Pseudo-Poisson Maximum Likelihood (PPML) method is applied. This estimation method also controls for heteroscedasticity, allowing for more precise estimates. Furthermore, the PPML is preferred since it allows the inclusion of zero trade flows and, unlike the OLS estimation, it does not use the log-linearised gravity equation. Hence, the regression is run on all sectors with sector fixed effects, then sectors are differentiated by the type (products vs services) and by factor intensity. Finally, the model is run for each sector separately. We limit the analysis to the vertical depth and the difference of the rule of law. Other measures of depth and institutional gap are to be tested later.

5   Empirical Results

Table 1 (first column) reports the baseline regression and shows that the existence of a trade agreement (whether shallow or deep) promotes GVC participation, by increasing the FVA embedded in Egyptian exports compared to a situation where no trade agreement is in force. It is also noted that the coefficient of deep trade agreements is greater than that associated with shallow agreements. Precisely, on average, deep agreements increase FVA by 83.5%, whilst shallow agreements only increase FVA by 53% compared to the absence of trade agreements. This result is in line with the existing literature, e.g., Laget et al. (2020) and Tokas (2022).

The institutional gap's coefficient (the coefficient of difference in rule of law) has a negative sign, implying that an increase in the institutional gap between Egypt and its partners negatively affects the backward linkages with these partners. In other words, countries having close institutions are more likely to be engaged in value chains. However, this does not imply that aiming to become integrated with developed countries - having higher institutional quality - would cause Egyptian firms to reduce their participation in GVCs. In fact, openness to trade and foreign direct investment may create a demand for stronger institutions in Egypt and thus ameliorate the quality of the latter (Lehne, Mo and Plekhanov, 2014). As for the gravity controls, GDP and distance demonstrate the expected signs. Finally, whereas common language does not seem to affect GVC participation for Egypt, contiguity negatively affects Egypt's trade, given the political instability in its neighbouring countries[9].

As presented in the stylised facts section, backward linkages in products and services are not affected by trade agreements in the same way. With the aim of testing this hypothesis, an interaction variable between vertical depth and manufacturing products is introduced in Table 1. As the results show, the interaction terms have positive signs, meaning that participation in manufacturing value chains is more affected by trade agreements (whether shallow or deep) compared to services value chains. For products, the coefficient of shallow agreements would be 0.44 (0.229+0.211) and that of deep agreements 0.623 (0.395+0.228). Thus, for manufacturing products, and compared to the absence of trade agreements, shallow and deep agreements are associated, on average, with a 55% and 86.5% increase in backward linkages, respectively. Concerning services, shallow agreements are, on average, associated with a 25.7% increase in backward linkages, whilst the increase is 48.4% for deep agreements. Laget et al (2020) conclude that GVC participation in

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[9] Appendix XX includes the results of the baseline regression with bilateral fixed effects, instead of the gravity controls.

services is more affected by trade agreements, mainly those including behind-the-border provisions, compared to manufacturing products. Given that the majority of trade agreements signed by Egypt do not focus on behind-the-border provisions (i.e., competition policy, investment, IPR, etc...), the effect on services is rather limited. With this heterogeneity, we run different regressions for products and services. Table 1 (columns 3 and 4) shows that the coefficients of the depth terms are larger for products compared to services. The coefficient of shallow (deep) agreements is almost 1.5 (1.36) times larger for products compared to services, confirming the fact that it has a few trade agreements focusing on services (Borchert and Di Ubaldo, 2021).

Table 1: Deep Trade Agreements, Institutions, and GVC

	FVA	FVA	Services FVA	Products FVA
Vertical depth (1)	0.426***	0.229**	0.299***	0.437***
	(0.0551)	(0.0897)	(0.0486)	(0.0587)
Vertical depth (2)	0.607***	0.395***	0.455***	0.619***
	(0.0259)	(0.0831)	(0.0295)	(0.0275)
Rule of law (gap)	-0.213***	-0.213***	0.000549	-0.228***
	(0.0202)	(0.0430)	(0.0186)	(0.0213)
Contiguity	-0.883***	-0.883***	-0.862***	-0.881***
	(0.0711)	(0.134)	(0.0811)	(0.0756)
Common language	0.0195	0.0195	0.0632**	0.0150
	(0.0308)	(0.0495)	(0.0288)	(0.0328)
Colonial links	-2.678***	-2.678***	-1.331***	-2.873***
	(0.168)	(0.218)	(0.335)	(0.186)
Distance	-0.551***	-0.551***	-0.341***	-0.566***
	(0.0232)	(0.0314)	(0.0252)	(0.0247)
Exporter's GDP	1.041***	1.041***	0.979***	1.046***
	(0.00969)	(0.0166)	(0.00853)	(0.0104)
Egypt's GDP	0.317***	0.317***	0.375***	0.312***
	(0.0231)	(0.0410)	(0.0217)	(0.0245)
Vertical depth (1)*Manufacturing		0.211*		
		(0.112)		
Vertical depth (2)*Manufacturing		0.228**		
		(0.0919)		
Manufacturing		2.174***		
		(0.0719)		
Constant	-14.74***	-17.64***	-18.61***	-14.45***
	(0.432)	(0.893)	(0.392)	(0.455)
Observations	**99,762**	**99,762**	**42,207**	**57,555**

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Surprisingly, the regression revealed that services are not affected by the institutional gap. This result may seem illogical, since services are known for being complex and, consequently, require strong institutions and more transparency from both partners. The literature on services and institutions supports the negative effect of the institutional gap on exports of services (Karam and Zaki, 2019). Finally, the common language coefficient is positive and significant for FVA in services. This may arise from the large amount of communications needed in services, which is facilitated if the two parties speak the same language. These results reveal the heterogeneity between products and services assuming that each of two categories is internally homogenous.

Yet, the descriptive analysis showed the heterogeneity between products and services having different factor intensities. Thus, an interaction is created between depth and factor intensity of products and services. The regression includes five factor intensity groups for products and two for services, with human-capital intensive products as the base category (Table 2). Generally, a negative (positive) coefficient for any interaction term means that this category is less (more) affected by the type of trade agreements present in the interaction, compared to human-capital intensive products. For instance, unskilled labour-intensive products and services both have negative but non-significant coefficients when interacting with deep trade agreements. This result is not expected since unskilled labour-intensive products and services are less complex and their value-added is low compared to human capital-intensive ones. This tends to contradict the results of previous studies, such as Tokas (2022) and Orefice and Rocha (2014), concerning the different effect deep trade agreements have on each sector, depending on the value-added of the latter. Moreover, the highest coefficient for this interaction is that of primary products indicating that the GVC participation in these products is the most affected by deep agreements. In fact, this is in line with Egypt's comparative advantage and shows that primary products include agriculture and fishing exports, which are subject to several sanitary and phyto-sanitary measures (El-Enbaby et al., 2016) and technical barriers to trade (Kamal and Zaki, 2019), which require deep trade agreements.

Given this heterogeneity, the model is replicated separately for each category of factor intensity (Table 3). The largest coefficients of deep trade agreements are associated with primary products, technology-intensive products and natural resource-intensive products respectively, which is again in line with Egypt's comparative advantage. On the other hand, human capital- intensive products have the lowest coefficient of deep trade agreements. In fact, for these types of products, the coefficients of shallow and deep agreements are close. This may be related to the type of provisions included in the agreement, specifically labour provisions. The analysis of Timini et al (2021) shows the importance of labour provisions in boosting

trade in labour-intensive sectors. The paper argues that including enforceable labour provisions in South-North agreements helps boost trade in labour-intensive sectors.

Concerning the institutional gap, it appears to have a significant negative effect only for primary, unskilled labor-intensive and natural resource-intensive products. Again, this result seems to be counter-intuitive given that institutions should matter for technology and human capital-intensive exports, due to the complexity and the specificity of assets in those sectors. Nevertheless, the same conclusion has been reached by Álvarez et al (2018). The authors attribute this to the exploitation of benefits in natural resources and primary products, resulting from weak governance and widespread corruption. Therefore, they suggest that any amelioration of institutions is trade enhancing in the aforementioned sectors, especially for developing countries.

Table 2: Factor Intensity and Agreement Depth

	FVA
Vertical depth (1)	0.0584
	(0.0958)
Vertical depth (2)	0.512***
	(0.0661)
Vertical depth (1)*human capital services	0.0338
	(0.110)
Vertical depth (1)*natural resource products	0.293**
	(0.140)
Vertical depth (1)*primary products	0.424***
	(0.138)
Vertical depth (1)*technology products	0.0423
	(0.123)
Vertical depth (1)*unskilled labour products	0.403**
	(0.167)
Vertical depth (1)*unskilled labour services	0.215
	(0.135)
Vertical depth (2)*human capital services	-0.211***
	(0.0763)
Vertical depth (2)*natural resource products	0.148
	(0.0928)
Vertical depth (2)*primary products	0.185**
	(0.0920)
Vertical depth (2)*technology products	0.178**

	(0.0751)
Vertical depth (2)*unskilled labour products	-0.0688
	(0.122)
Vertical depth (2)*unskilled labour services	-0.0862
	(0.105)
Human capital services	-0.722***
	(0.0583)
Natural resource products	1.612***
	(0.0685)
Primary products	2.503***
	(0.0673)
Technology products	2.287***
	(0.0528)
Unskilled labour products	2.317***
	(0.0964)
Unskilled labour services	0.510***
	(0.0815)
Constant	-17.67***
	(0.865)
Observations	95,925

Notes: (i) Robust standard errors in parentheses, (ii) *** $p<0.01$, ** $p<0.05$, * $p<0.1$
(iii) The control variables are controlled for but were omitted for the sake of brevity.

Table 3: Factor Intensity and Agreement Depth (II)

	Products					Services	
	Human-Capital	**Natural-resource**	**Primary**	**Technology**	**Unskilled labour**	**Unskilled labour**	**Human Capital**
Vertical depth (1)	0.325***	0.380***	0.447***	0.375***	0.444***	0.289***	0.350***
	(0.111)	(0.124)	(0.123)	(0.104)	(0.156)	(0.106)	(0.0683)
Vertical depth (2)	0.355***	0.569***	0.667***	0.593***	0.544***	0.471***	0.406***
	(0.0590)	(0.0793)	(0.0787)	(0.0572)	(0.101)	(0.0917)	(0.0562)
Contiguity	-0.599***	-0.798***	-0.946***	-0.574***	-0.849***	-0.894***	-0.747***
	(0.141)	(0.194)	(0.200)	(0.138)	(0.246)	(0.194)	(0.123)
Common lang.	-0.306***	-0.138*	0.115	-0.313***	-0.0566	0.0798	0.000304
	(0.0635)	(0.0734)	(0.0744)	(0.0583)	(0.0948)	(0.0797)	(0.0518)
Colonial links	-2.792***	-2.969***	-3.065***	-2.918***	-2.493***	-1.275***	-1.594***
	(0.407)	(0.389)	(0.330)	(0.422)	(0.470)	(0.375)	(0.275)
Distance	-0.602***	-0.577***	-0.607***	-0.525***	-0.497***	-0.333***	-0.374***
	(0.0515)	(0.0504)	(0.0470)	(0.0488)	(0.0614)	(0.0481)	(0.0313)
Exporter's GDP	1.076***	1.037***	1.037***	1.074***	1.060***	0.958***	1.053***
	(0.0191)	(0.0242)	(0.0246)	(0.0183)	(0.0338)	(0.0240)	(0.0153)
Egypt's GDP	0.303***	0.368***	0.293***	0.333***	0.319***	0.390***	0.324***
	(0.0448)	(0.0602)	(0.0609)	(0.0448)	(0.0829)	(0.0711)	(0.0444)
Rule of law (gap)	0.00728	-0.176***	-0.200***	0.000255	-0.356***	-0.00877	0.0291
	(0.0418)	(0.0611)	(0.0622)	(0.0437)	(0.0896)	(0.0642)	(0.0390)
Constant	-17.88***	-16.69***	-14.19***	-16.78***	-16.08***	-18.93***	-20.66***
	(0.870)	(1.239)	(1.274)	(0.875)	(1.818)	(1.435)	(0.868)
Observations	**3,837**	**7,674**	**23,022**	**3,837**	**15,348**	**19,185**	**23,022**

Notes: (i) Robust standard errors in parentheses, (ii) *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Classifying sectors by their factor intensity is helpful for revealing underlying differences. However, it is worth noting that the sectors presented in the UNCTAD-Eora dataset do not follow any international classification, such as the Harmonised System (HS). Consequently, classifying these sectors by factor intensity could be inaccurate and could be the reason behind conflicting results. In order to avoid inaccuracies resulting from data aggregation, the relationship between deep trade agreements and GVCs is examined for each sector separately (see Table 4). GVCs of the electricity, gas and water sector appear to be the most affected by deep trade agreements in Egypt. Overall, participation in GVCs for all the primary products - except for fishing – is strongly affected by deep trade agreements. In addition, large

positive coefficients are associated with other low value-added sectors such as construction and textiles, where Egypt has a comparative advantage. As mentioned previously, these results may seem illogical compared to the findings of other papers which support the strong effect of trade agreements on high value-added sectors. Yet, given the types of provisions included in trade agreements signed by Egypt and their enforceability, these results should not be surprising ([Table A.1](#)). For instance, 100% of trade agreements concerned in this study include legally enforceable agricultural provisions. On the other hand, only 27% of Egypt's partners are concerned with labour market provisions and none of them are legally enforceable. Furthermore, sanitary and phytosanitary (SPS), along with technical barriers to trade (TBT) provisions, are legally enforceable only for 38% and 6% of the partners. Hence, the included and enforceable provisions in trade agreements - even deep ones - are those that stimulate trade in primary products. However, the analysis of provisions and their effect on different sectors is beyond the scope of this study.

To this point, the analysis has been done from a static perspective, as the previous paragraphs presented the most/least affected sectors by deep trade agreements from 1995 to 2017. Given that this period is characterised by consecutive waves of protectionism, we divide it into three periods with respect to two major crisis - the Internet bubble in 2001 and the financial crisis in 2008 - in order to see how Egypt has changed or upgraded its FVA structure over time, thanks to deeper trade agreements. Thus, one can observe that trade agreements (whether shallow or deep) have a major role in increasing Egypt's participation in trade agreements, especially in recent years.

For the first period, it is observed that all the coefficients are either negative or insignificant for both shallow and deep agreements (Table 5). This shows that concluding trade agreements either did not affect or negatively affected FVA in Egyptian exports during the period. As of 2001, the majority of the coefficients became significantly positive and increased in the following period (2008-2017). For instance, the coefficient of deep agreements is -1.57 for financial services in the second period. This could be the result of the worldwide instability in the aftermath of the Internet bubble. In addition, the Egyptian economy was characterised by being a rentier state, focusing on petroleum and gas exports, which also have one of the largest coefficients for deep trade agreements in that period. Generally, it appears that the highest coefficients are associated with the primary products, as was the conclusion from previous analysis.

Despite this, some other sectors experienced large increases in their coefficients between the last two periods. Although primary products, such as agriculture and mining, experienced large increases, other technology and human capital-intensive sectors have larger increases ([Table A.2](#)). For instance, the coefficient of transportation equipment increased by 125% for shallow agreements

and 175% for deep agreements. The same applies for machinery, for which the increase was 155% and 124% in the shallow and deep agreements' coefficients respectively. The coefficients of other sectors, such as manufacturing and financial services, have also had large increases. These substantial changes show the increase in GVC participation for these sectors. Thus, participation in more advanced tasks in value chains has been relatively gaining in importance, confirming how Egypt managed to slightly upgrade its value chains, thanks to deeper trade agreements.

To extend our results, we use alternative definitions of our main variables of interest. As presented in the data and methodology section, the World Governance Indicators website provides different measures for the quality of institutions. The previous analysis was conducted with the rule of law variable. The coefficients presented in Table 1, are re-estimated using three different measures of the institutional gap - control of corruption, government effectiveness and the average of the three measures - and reported in Table 6. All the institutional gap variables have negative and significant coefficients, as expected. Our results - using the different measures of institutions - suggest that the institutional gap reduces the FVA in Egyptian exports by 12% to 20% on average. Yet, the rule of law has the largest coefficient compared to other measures. Concerning the depth variable, its coefficients are positive and significant, with deep agreements having a larger coefficient compared to shallow ones, regardless of the measure of the institutional gap. As for the rest of the control variables, they all have the same signs and significance as in the baseline model.

In addition, the horizontal depth, derived from the database of Hoffman et al (2017), is used instead of the vertical depth. The results reported in Table 7, show positive coefficients for the two categories of depth regardless of the measure used for institutional gap. Again, the coefficient of deep trade agreements is much larger than that of shallow agreements. However, the coefficients are not as large as those of vertical depth. In fact, this observation should not be surprising, given the calculation methods of both measures of depth. First, whilst horizontal depth captures 52 provisions, the vertical depth is calculated based on 18 of the most frequently used provisions. Thus, it makes sense that vertical depth would have a stronger impact on GVCs, given that it ignores the provisions, which do not appear in many agreements. Second, the vertical depth assesses each provision by more than one indicator, instead of just examining whether or not the provision is mentioned in the agreement in question. These regressions also confirm the negative effect of the institutional gap on GVCs.

Table 4: Disaggregated Sectors and Agreement Depth

Factor intensity	Sector	D1	D2
Primary products	Agriculture	0.444***	0.636***
	Electricity, Gas and Water	0.485***	0.725***
	Fishing	0.0994	0.371***
	Food & Beverages	0.429***	0.640***
	Mining and Quarrying	0.416***	0.622***
Natural resource-intensive products	Petroleum, Chemical and Non-Metallic Mineral Products	0.464***	0.688***
	Metal Products	0.362***	0.564***
	Wood and Paper	0.487***	0.598***
Unskilled labour-intensive products	Construction	0.455***	0.596***
	Other Manufacturing	0.387***	0.508***
	Recycling	0.320***	0.507***
	Textiles and Wearing Apparel	0.450***	0.547***
Human capital-intensive products	Transport Equipment	0.325***	0.355***
Technology-intensive products	Electrical and Machinery	0.375***	0.593***
Unskilled labour intensive services	Hotels and Restaurants	0.384***	0.586***
	Private Households	0.174*	0.289***
	Re-export & Re-import	-0.164**	-0.181**
	Retail Trade	0.390***	0.516***
	Transport	0.384***	0.488***
Human capital-intensive services	Education, Health and Other Services	0.416***	0.447***
	Financial Intermediation and Business Activities	-0.293	-1.471***
	Maintenance and Repair	0.139*	0.233***
	Post and Telecommunications	0.351***	0.532***
	Public Administration	0.430***	0.513***
	Wholesale Trade	0.322***	0.316***

Notes: (i) Robust standard errors in parentheses, (ii) *** $p<0.01$, ** $p<0.05$, * $p<0.1$
(iii) The control variables are controlled for but were omitted for the sake of brevity.
(iv) D1 stands for vertical depth (1) and D2 stands for vertical depth (2).

Table 5: GVC Upgrading and Agreement Depth

Factor intensity	Sectors	D1			D2		
		1995-2000	2001-07	2008-17	1995-2000	2001-07	2008-17
Primary products	Agriculture	0.102	0.327**	0.542***	-0.134	0.390***	0.871***
	Electricity, Gas and Water	-0.0406	0.423**	0.625***	-0.861***	0.541***	1.079***
	Fishing	-0.124	0.0603	0.173*	-0.416***	0.252***	0.559***
	Food & Beverages	0.115	0.300**	0.516***	0.0783	0.420***	0.841***
	Mining and Quarrying	-0.0486	0.316*	0.546***	-0.828***	0.349***	0.945***
	Petroleum, Chemical and Non-Metallic Mineral Products	0.047	0.431**	0.534***	-0.747***	0.436***	0.941***
Natural resource-intensive products	Metal Products	-0.11	0.182	0.441***	-0.820***	0.381***	0.725***
	Wood and Paper	0.0588	0.393***	0.597***	-0.21	0.389***	0.865***
Unskilled labour-intensive products	Construction	-0.0202	0.313**	0.534***	-0.599***	0.412***	0.778***
	Other Manufacturing	-0.109	0.203	0.503***	-0.644***	0.331***	0.751***
	Recycling	-0.0565	0.226	0.403***	-0.641***	0.266***	0.737***
	Textiles and Wearing Apparel	-0.0384	0.298*	0.574***	-0.702***	0.324***	0.851***
Human capital-intensive products	Transport Equipment	-0.0666	0.207	0.467***	-0.745***	0.251***	0.691***
Technology-intensive products	Electrical and Machinery	-0.0639	0.187	0.478***	-0.734***	0.370***	0.828***
Unskilled labour-intensive services	Hotels and Restaurants	0.0125	0.277**	0.474***	-0.14	0.433***	0.795***
	Private Households	-0.192**	0.0498	0.204*	-0.543***	0.347***	0.308***
	Re-export & Re-import	-0.200***	-0.0788	-0.188**	-0.301***	-0.0298	-0.307**
	Retail Trade	-0.0972	0.259**	0.455***	-0.598***	0.388***	0.649***
	Transport	0.000596	0.300***	0.429***	-0.363*	0.315***	0.576***
Human capital-intensive services	Education, Health and Other Services	-0.0394	0.287**	0.513***	-0.523***	0.300***	0.684***
	Financial Intermediation and Business Activities	-0.127	-0.289	0.480***	-0.521**	-1.570***	0.595***
	Maintenance and Repair	-0.180**	0.0176	0.164*	-0.448***	0.226***	0.189**
	Post and Telecommunications	-0.0955	0.234**	0.409***	-0.458**	0.355***	0.635***
	Public Administration	0.0174	0.319**	0.463***	-0.400**	0.421***	0.582***
	Wholesale Trade	-0.111	0.193*	0.347***	-0.346	0.169**	0.203**

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Other measures for institutions

	(1) FVA	(2) FVA	(3) FVA
Vertical depth (1)	0.425***	0.471***	0.431***
	(0.0547)	(0.0564)	(0.0551)
Vertical depth (2)	0.600***	0.523***	0.587***
	(0.0272)	(0.0269)	(0.0265)
Control of corruption (gap)	-0.172***		
	(0.0184)		
Government effectiveness (gap)		-0.128***	
		(0.0203)	
Institutions (gap)			-0.186***
			(0.0207)
Contiguity	-0.942***	-0.820***	-0.897***
	(0.0703)	(0.0743)	(0.0714)
Common language	0.000991	-0.0448	-0.00262
	(0.0313)	(0.0320)	(0.0312)
Colonial links	-2.557***	-2.633***	-2.621***
	(0.170)	(0.170)	(0.169)
Distance	-0.563***	-0.583***	-0.560***
	(0.0230)	(0.0230)	(0.0230)
Exporter's GDP	1.044***	1.044***	1.045***
	(0.0101)	(0.0105)	(0.0101)
Egypt's GDP	0.252***	0.318***	0.294***
	(0.0235)	(0.0243)	(0.0233)
Constant	-13.50***	-14.59***	-14.30***
	(0.427)	(0.472)	(0.439)
Observations	99,502	99,398	99,398

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 7: GVC and Horizontal Depth

	(1) FVA	(2) FVA	(3) FVA	(4) FVA
Horizontal depth (1)	0.155***	0.123***	0.122***	0.137***
	(0.0454)	(0.0440)	(0.0460)	(0.0452)
Horizontal depth (2)	0.489***	0.432***	0.498***	0.479***
	(0.0313)	(0.0291)	(0.0291)	(0.0298)
Control of corruption (gap)	-0.105***			
	(0.0198)			
Government effectiveness (gap)		-0.0797***		
		(0.0207)		
Rule of law (gap)			-0.145***	
			(0.0217)	
Institutions (gap)				-0.117***
				(0.0217)
Contiguity	-0.421***	-0.372***	-0.381***	-0.398***
	(0.0751)	(0.0790)	(0.0783)	(0.0770)
Common language	-0.259***	-0.282***	-0.231***	-0.255***
	(0.0306)	(0.0323)	(0.0299)	(0.0305)
Colonial links	-3.045***	-3.095***	-3.112***	-3.081***
	(0.245)	(0.245)	(0.243)	(0.244)
Distance	-0.569***	-0.591***	-0.569***	-0.572***
	(0.0326)	(0.0323)	(0.0320)	(0.0324)
Exporter's GDP	1.005***	1.006***	1.004***	1.006***
	(0.00693)	(0.00738)	(0.00651)	(0.00695)
Egypt's GDP	0.314***	0.360***	0.361***	0.343***
	(0.0246)	(0.0241)	(0.0230)	(0.0235)
Constant	-13.78***	-14.47***	-14.60***	-14.27***
	(0.397)	(0.441)	(0.406)	(0.409)
Observations	78,442	78,338	78,702	78,338

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6   Conclusion

Different studies prove the existence of a significant positive effect on GVCs attributed to trade agreements, especially deep ones. Those studies also recognise that GVCs of different products are differently affected by trade agreements, depending on their depth and the type of provisions covered. As many papers suggest, products with higher complexity and higher innovation are those that are most affected by deep agreements. This paper provides new evidence on the effect of deep trade agreements on GVCs for Egypt. The study also sheds light on the importance of the institutional gap in hindering the participation in GVCs. Bilateral data on FVA originating from other countries and embedded in Egyptian exports in different sectors, is used to conduct the analysis. The depth of trade agreements is derived from the datasets of Mattoo et al. (2020) and Hoffmann et al. (2017). The findings of the paper support the positive relationship between the depth of trade agreements and GVCs at the aggregated level. In addition, the difference in the quality of institutions reduces this positive effect. However, the sectoral analysis revealed a great deal of heterogeneity across different sectors. Comparing the coefficients of trade agreements for different periods, one can conclude that GVC linkages in human capital and technology- intensive products have started to respond to deep trade agreements, pointing towards the agreement depth being important in the upgrading of exports upgrading. Nevertheless, Egypt's participation in GVCs is mainly concentrated in the lower end of different product value chains, by providing raw materials and fuel. The implementation of provisions, such as intellectual property rights, competition law and labour market regulations, would encourage exports in the aforementioned products and services.

From a policy lens, Egypt suffers from two main problems when it comes to GVCs: the low participation in GVCs in general and in high value-added chains in particular. These results reveal the importance of deepening trade agreements. Even though trade liberalisation through decreasing tariffs is known for stimulating GVC participation, the effect would be more pronounced if PTA include other provisions related to non-tariff measures, since decreasing tariffs would not encourage backward linkages any further (Kowalski, Gonzalez and Ugarte, 2015). For instance, it is crucial to negotiate provisions stimulating exports in high value-added products and services, in order to allow Egypt to diversify its role in GVCs. As Kowalski, Gonzalez and Ugarte (2015) show, intellectual property rights (IPR) and institutional quality are the policy areas having the highest impact on GVC participation for developing countries. By examining Egypt's trade agreements, one can observe that none of them include anti-corruption provisions. In addition, less than half the country's partners are concerned with IPR provisions. Hence, including such provisions in existing trade agreements would strengthen the participation of Egyptian firms in GVCs, especially in more complicated stages.

Second, it should also be noted that an increase in institutional quality would have positive effects on FDI inflows, by decreasing the risk associated with investing. As FDI inflows transmit modern technologies and know-how, this would have spillover effects on Egyptian firms allowing them to be more productive and competitive. Thus, besides ameliorating institutional quality, facilitating administrative processes related to the installation of foreign firms in Egypt, would promote FDI inflows and, consequently, GVC participation.

Recent events, ranging from the war in Ukraine to COVID-19, played a significant role in reshaping the GVCs in different industries. For Egypt to be capable of benefiting the most from these shocks, the country needs to encourage firms in different sectors to participate in GVCs. The required provisions and the implementation of deep trade agreements could play an important role in this matter.
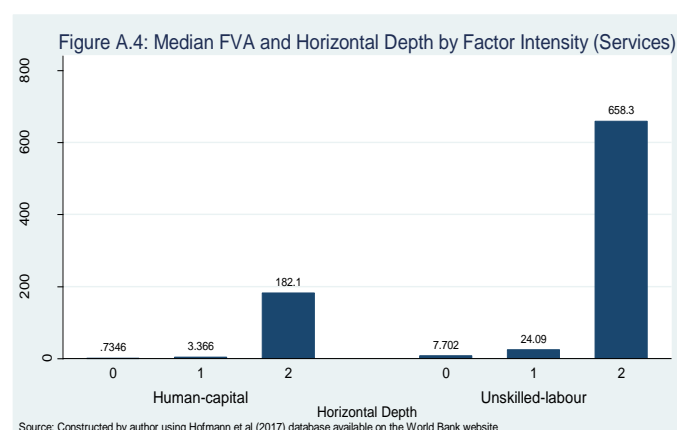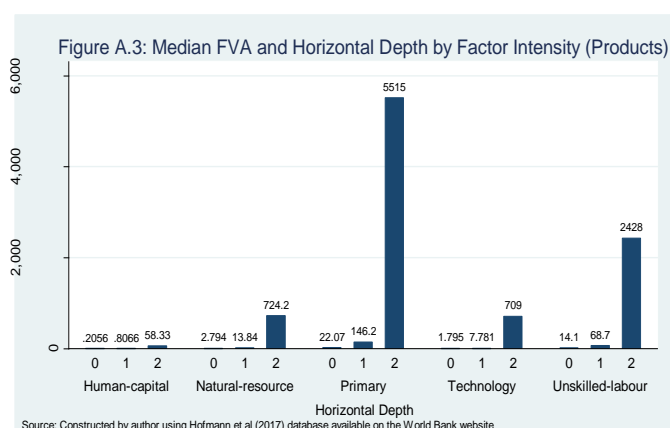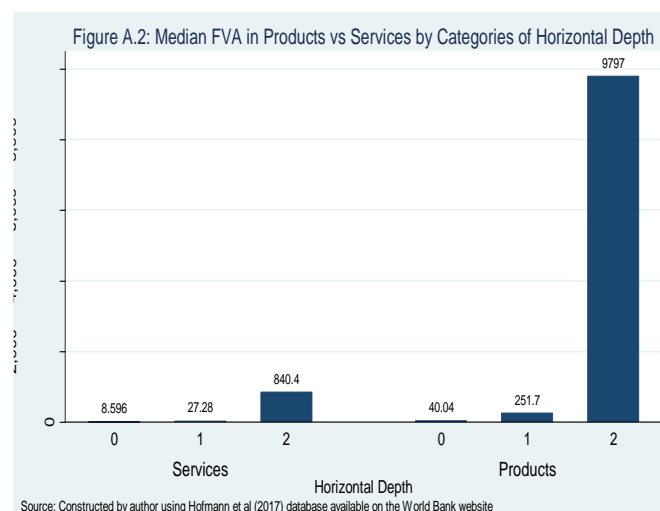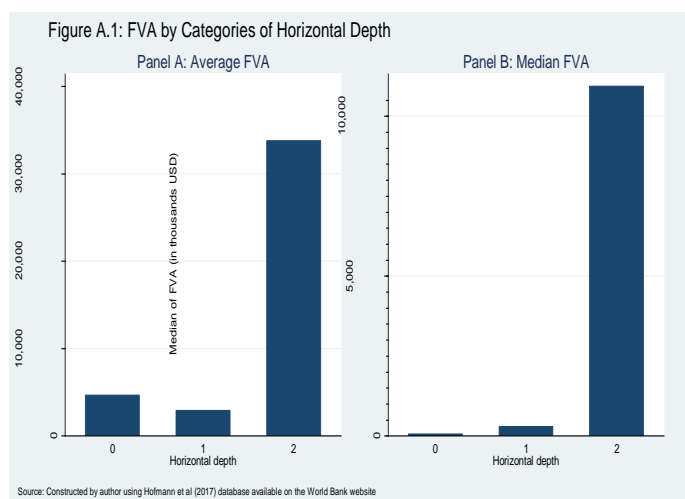
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Appendices

Appendix 1: Descriptive Statistics

Figure A.1: FVA by Categories of Horizontal Depth

Figure A.2: Median FVA in Products vs Services by Categories of Horizontal Depth

Figure A.3: Median FVA and Horizontal Depth by Factor Intensity (Products)

Figure A.4: Median FVA and Horizontal Depth by Factor Intensity (Services)

Table A.1: Share of Partners Concerned with Different Provisions

Provision Type	Provisions	Included	Legally enforceable
WTO Plus	FTA Industrial	100.00	100.00
	FTA Agriculture	100.00	100.00
	Customs administration	76.12	76.12
	Export taxes	76.12	76.12
	SPS	34.33	34.33
	TBT	76.12	5.97
	State trading enterprises	49.25	49.25
	Antidumping	76.12	74.63
	Countervailing measures	74.63	47.76
	State aid	76.12	74.63
	Public procurement	49.25	0.00
	TRIMS	0.00	0.00
	GATS	34.33	5.97
	TRIPs	49.25	49.25
WTO-X		0.00	0.00
	Competition policy	76.12	76.12
	Environmental laws	68.66	0.00
	IPR	47.76	47.76
	Investment	76.12	26.87
	Labour market regulation	26.87	0.00
	Movement of capital	76.12	68.66
	Consumer protection	41.79	0.00
	Data protection	0.00	0.00
	Agriculture	68.66	0.00
	Approximation of legislation	41.79	0.00
	Audiovisual	41.79	0.00
	Civil protection	0.00	0.00
	Innovation policies	0.00	0.00
	Cultural cooperation	68.66	0.00
	Economic policy dialogue	26.87	0.00
	Education and training	68.66	0.00
	Energy	68.66	0.00
	Financial assistance	74.63	0.00
	Health	26.87	0.00

Table A.1(Continued): Share of Partners Concerned with Different Provisions

Provision Type	Provisions	Included	Legally enforceable
WTO-X		41.79	0.00
	Illegal immigration	41.79	0.00
	Illicit drugs	68.66	0.00
	Industrial cooperation	68.66	0.00
	Information society	68.66	26.87
	Mining	0.00	0.00
	Money laundering	41.79	0.00
	Nuclear safety	0.00	0.00
	Political dialogue	41.79	0.00
	Public administration	0.00	0.00
	Regional cooperation	68.66	0.00
	Research and technology	68.66	0.00
	SMEs	0.00	0.00
	Social matters	68.66	0.00
	Statistics	68.66	0.00
	Taxation	7.46	0.00
	Terrorism	41.79	0.00
	Visa and asylum	0.00	0.00

Source: Constructed by Author using Hofmann et al (2017) dataset

Table A.2: Variation of Depth Coefficients for Each Sector Between 2001-2007 and 2008-2017

Factor intensity	Sectors	Δ D1	Δ D2
Primary products	Agriculture	65.75	123.33
	Electricity, Gas and Water	47.75	99.45
	Fishing	186.90	121.83
	Food & Beverages	72.00	100.24
	Mining and Quarrying	72.78	170.77
	Petroleum, Chemical and Non-Metallic Mineral Products	23.90	115.83
Natural resource-intensive products	Metal Products	142.31	90.29
	Wood and Paper	51.91	122.37
Unskilled labour-intensive products	Construction	70.61	88.83
	Other Manufacturing	147.78	126.89
	Recycling	78.32	177.07
	Textiles and Wearing Apparel	92.62	162.65
Human capital-intensive products	Transport Equipment	125.60	175.30
Technology-intensive products	Electrical and Machinery	155.61	123.78
Unskilled labour-intensive services	Hotels and Restaurants	71.12	83.60
	Private Households	309.64	-11.24
	Re-export & Re-import	138.58	930.20
	Retail Trade	75.68	67.27
	Transport	43.00	82.86
Human capital-intensive services	Education, Health and Other Services	78.75	128.00
	Financial Intermediation and Business Activities	-*	-*
	Maintenance and Repair	831.82	-16.37
	Post and Telecommunications	74.79	78.87
	Public Administration	45.14	38.24
	Wholesale Trade	79.79	20.12

Source: Constructed by Author using Table 7 output
*** Note**: the rate of change for this sector could not be calculated as coefficients shifted from being negative in the first period to positive in the second period.

Appendix 2: Results

Table A3.1. Baseline Regression with Fixed Effects

	FVA	FVA	Services FVA	Products FVA
Vertical depth (1)	0.0485	-0.148	0.130	0.0411
	(0.121)	(0.266)	(0.135)	(0.120)
Vertical depth (2)	0.393***	0.182	0.340***	0.397***
	(0.0681)	(0.214)	(0.0742)	(0.0676)
Rule of law (gap)	0.205***	0.205***	0.302***	0.197***
	(0.0678)	(0.0678)	(0.0772)	(0.0674)
Exporter's GDP	1.076***	1.076***	1.153***	1.072***
	(0.0987)	(0.0987)	(0.108)	(0.0983)
Egypt's GDP	0.167***	0.167***	0.185***	0.165***
	(0.0539)	(0.0539)	(0.0583)	(0.0538)
Vertical depth (1)*Manufacturing		0.211		
		(0.257)		
Vertical depth (2)*Manufacturing		0.227		
		(0.184)		
Constant	-17.43***	-17.43***	-21.79***	-17.12***
	(1.674)	(1.675)	(1.768)	(1.666)
Observations	**101,192**	**101,192**	**42,812**	**58,380**

Robust standard errors in parentheses. Errors are clustered at the bilateral level. The regressions
include bilateral and product fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

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