Economics Bulletin

Volume 43, Issue 4

Vulnerability and resilience: crisis transmission channels for GVCs in COVID times

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Abstract

Firms that are part of GVCs are better protected from the transmission channels for the negative effects of COVID-19. They also show greater resilience and so better performance. There are nuances in the results depending on whether GVC affiliation is defined in a moderately lax or strict way. The results highlight the detrimental effect of the global trend toward inward looking protectionism.

We are thankful for the generous financial support provided by the project 'Stability and Development in the Middle East and North Africa', funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) towards the administration of the 2020/21 Egyptian Industrial Firm Behavior Survey (EIFBS) instrument. The contents of this document are the sole responsibility of the authors and do not reflect the position of the BMZ. We are grateful to Dr. Zakaria Othman for undertaking the sampling. Thanks are also due to Marian Adel for superb research assistance and diligence. EIFBS data are accessible from: Egypt, Arab Rep. - Egyptian Industrial Firm Behavior Survey, EIFBS 2020/21 (erfdataportal.com)

Citation: Amirah El-Haddad and Chahir Zaki, (2023) "Vulnerability and resilience: crisis transmission channels for GVCs in COVID times", *Economics Bulletin*, Volume 43, Issue 4, pages 1581-1592

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Submitted: June 13, 2023. **Published:** December 30, 2023.

1. Introduction

The COVID-19 pandemic has had severe economic consequences around the world. While most countries have instituted full or partial lock-down measures to limit the spread of the virus, the economic costs in terms of slowed growth and productivity, massive job losses, enterprise closures and broken value chains were substantial. Indeed, lockdown measures led to both demand and supply-side shocks prompting a 'ripple effect' (Dolgui et al. 2018) [1] and a 'supply chain contagion' (Baldwin and Tomiura 2020) resulting in a global economic crisis. Egypt was no exception to these developments.

Yet, despite this common shock firms were affected in a heterogeneous way depending on their innate characteristics and their behavioral traits (El-Haddad and Zaki 2023a). The objective of this paper is threefold. The first is to examine to what extent have firms that are part of Global Value Chains (GVCs) been more exposed to this shock compared to their non-GVC counterparts. Second, is to find out which transmission channels have played a larger role in propagating the shock and whether these channels differ by firm-level GVC affiliation. Finally, we assess whether firms that are part of GVCs have been more vulnerable and less resilient since they are – on account of their greater integration in the global economy- expected to be more exposed to this global shock. Or instead, whether have they been more resilient since they are more productive (Melitz 2003) and thus possess the ability and the tools to be able to withstand the negative implications of the pandemic induced restrictive and protectionist policies. This paper highlights differences in exposure and performance between the two types of firms. The relationships may be associational rather than causal.

We address these questions using unique data from our 2020/21 Egyptian Industrial Firm Behavior Survey (EIFBS)[2] of manufacturing firms. Following Dovis and Zaki (2020), we construct a GVC index to examine the differential propagation of transmission channels and the differing performance indicators by GVC affiliation status. We distinguish between supply and demand related transmission channels. The former include all disruptions that have negatively affected a firm's ability to supply its products including disruptions constraining inputs availability, disruptions directly limiting output delivery and those triggered through macroeconomic policies such as monetary, fiscal and trade policies. Demand-related channels are disruptions that have affected the demand on a firm's products either through direct channels such as cancellation of orders, or Egyptian and/or foreign partner country restrictive and protectionist trade policies.

We find that while protectionist trade policies of the 'great lockdown' have indeed been the main transmission channel of this crisis for *all* types of firms. However, firms affiliated with GVCs have reported a much smaller negative impact of this channel compared to their non-GVC counterparts. Additionally, on account of being more productive these firms have also shown

[1] The ripple effect, deals with low-frequency-high-impact disruption or exceptional risk (ibid.). It occurs when a disruption, rather than remaining localized or being contained to one part of the supply chain, cascades downstream and impacts the performance of the whole chain.

[2] OAMDI, 2023. Egyptian Industrial Firm Behavior Survey (EIFBS), Egypt, Arab Rep. - Egyptian Industrial Firm Behavior Survey, EIFBS 2020/21 (erfdataportal.com) Version 1.0 of Licensed Data Files; EIFBS 2020/2021- German Institute of Development and Sustainability (IDOS); Amirah El-Haddad. Egypt: Economic Research Forum (ERF).

superior post-pandemic performance. These results highlight the detrimental effect and failure of the global inward-looking protectionist trend that has imposed thousands of contractionary trade and foreign direct investment (FDI) measures (Baldwin and Evenett 2020) already a decade before the COVID-19 crisis hit the global economy.

The paper is organized as follows. Section 2 presents the data and some stylized facts. Section 3 discusses the main transmission channels of the crisis, differential exposure levels and performance post-COVID. Section 4 concludes.

2. Data and Stylized Facts

We use unique, recently collected, data from our 2020/21 Egyptian Industrial Firm Behavior Survey (EIFBS) of 2,383 manufacturing firms. The data were collected at the beginning of the second wave of COVID-19 extending to the height of that wave.[3] Two questionnaires were administered, one for firms that are still in operation, and another, similar one[4], for firms that had exited the market or temporarily suspended operations. The response rate is 75%, meaning that we successfully interviewed 2,383 establishments of which 2,338 are in operation and 45 firms that have either exited the market or were temporarily closed. Of the 766 firms we could not interview, an unknown number, and presumably a much higher proportion, have also exited the market.[5]

Following Dovis and Zaki (2020), we adopt two definitions of a firm being part of a GVC. The first one is a moderately lax one. A firm is said to be part of a GVC if the firm both exports and imports (either directly or indirectly). The second definition is stronger by adding two more criteria to the first definition. These are, (i) whether the firm has international certification; and (ii) whether the firm has any percentage of foreign ownership. Based on these two definitions, 1.2% of sample firms are moderately integrated into GVCs and 0.2%[6] are strongly integrated. Table A1 in the Annex includes some firm-level characteristics by type of GVC participation.

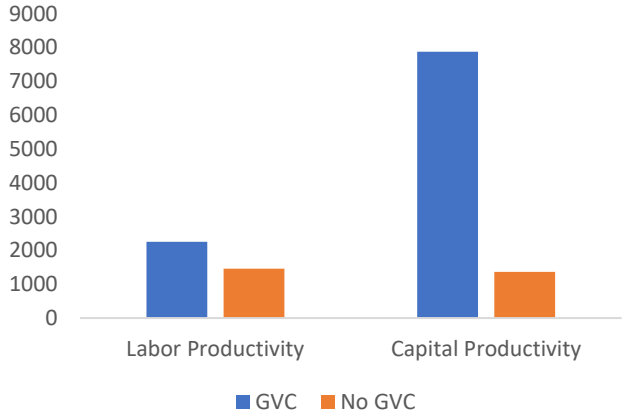
Figure 1a compares labor and capital productivity for GVC and non-GVC firms. It shows that the former have more productive factors of production and are therefore likely to be more resilient. However, by virtue of their global nature they are expected to be more exposed. Figure 1b depicts the macroeconomic shock that all firms were subject to. In the first quarter following the pandemic (April-June 2020) exports and imports dropped by 52% and 21% percent respectively, which most likely rendered GVC-integrated firms highly vulnerable to disruption. Despite their greater exposure to the shock, we find that their higher productivity is also reflected in their profit levels. GVC firms are relatively more profitable compared to their non-GVC

[3] Precisely between November 19th 2020 and the 5th of February 2021.
[4] Only four modules are slightly different. The main difference is that for temporarily closed or closed firms there are no values for current variables such as production, exports, employment or revenues.
[5] The questionnaire includes 14 modules: basic firm identification data, firm size, firm expectations on recovery and potential exit, changes in firm performance, pandemic transmission channels, ownership and management characteristics, innovation, management practices and use of information technology (IT), production costs, obstacles to operation, exports and global value chains, obstacles to exports, worker training and government support.
[6] Weights are used. Without weights, these figures are 16.43 and 3.28% respectively.

counterparts (Figure 1c). Eighty two percent of strict-GVC firms have achieved profits prior and post COVID compared to only 57% of their nonintegrated counterparts. The gap is somewhat less between the moderately integrated (67%) and their counterparts (55%).[7] Higher profitability explains why they are potentially better at absorbing shocks than others

Figure 1: Vulnerability and Resilience of firms

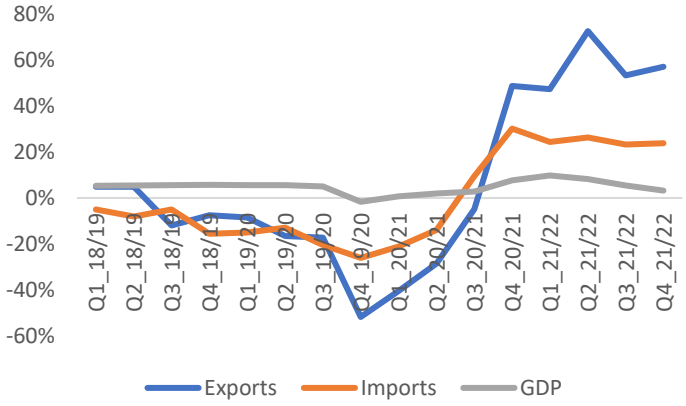
(a) Labor and Capital Productivity – by GVC participation



Source: Authors' own elaboration using the EIFBS.

Note: (i) Labor productivity is calculated by dividing total sales (in EGP) by the total number of permanent workers. (ii) Capital productivity is calculated by dividing total sales (in EGP) by issued capital (in EGP). (iii) GVC is defined as a firm that exports, imports, has an international certification and foreign ownership.

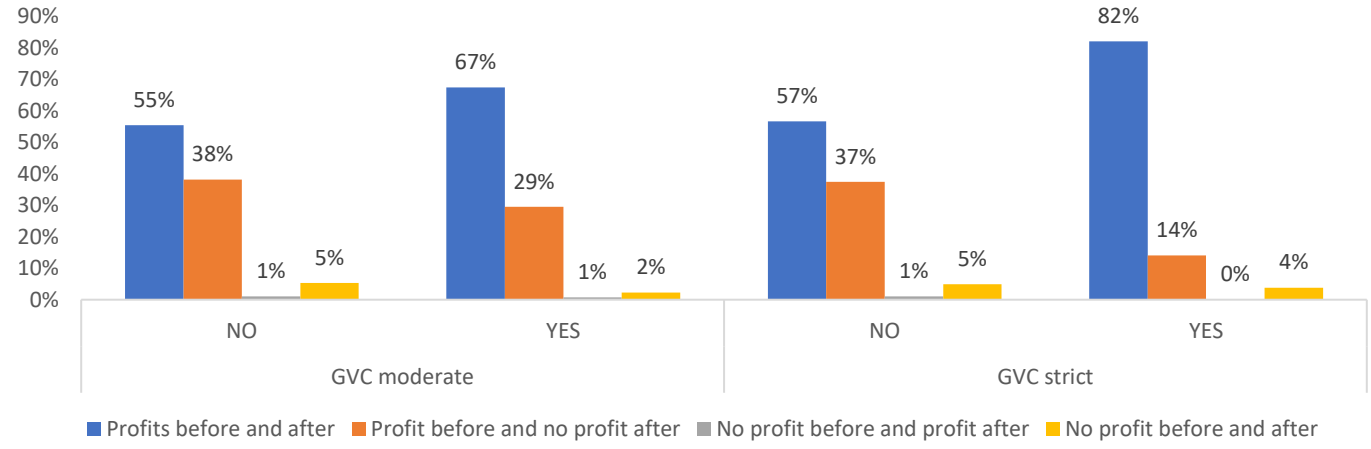
(b) Egyptian Exports and Imports' growth rates (%)



Source: Authors' own elaboration using data from the Ministry of Planning and Economic Development

Note: Growth rates have been calculated using national accounts data at constant prices (2016/2017).

(c) Share of firms making profits before and after COVID – by GVC participation



Source: Authors' own elaboration using the EIFBS.

[7] We observe similar trends for the other categories of profits in Figure 1c.

3. Transmission Channels: Exposure and Performance

The crisis emanating from the pandemic has caused both demand and supply side shocks, which have been more far reaching than any crisis in living memory. We distinguish between supply and demand related transmission channels.

Supply shocks include all disruptions that have negatively affected a firm's ability to supply its products. These include: 1) disruptions *constraining inputs availability* such as liquidity constraints, depletion of raw materials in inventories, inability to procure inputs on the domestic market, to find alternative domestic suppliers or to pay for imported inputs ; 2) the fear of or the actual *infection* with the virus[8] constrain both input and output availability; 3) disruptions directly *limiting output delivery* such as the inability or delay in delivering the product to domestic clients, or the difficulty in finding alternative distribution channels or the depletion of a firms' product inventory; 4) *macroeconomic policies* that may have *constrained product supply* during COVID; these include: a. *monetary policy* such as debt-related measures that affected a firm's ability to access affordable financial products, the difficulty with which pre-COVID bank loans were negotiated; and the concern over penalties imposed due to delayed debt service payments; b. *fiscal policies* pertaining to the penalties imposed on account of delayed tax payments and the predictability of taxation; and finally, c. *trade policies* restricting the flow of imports such as customs delays or direct bans on imports in Egypt, or partner countries restricting their exports into the country.

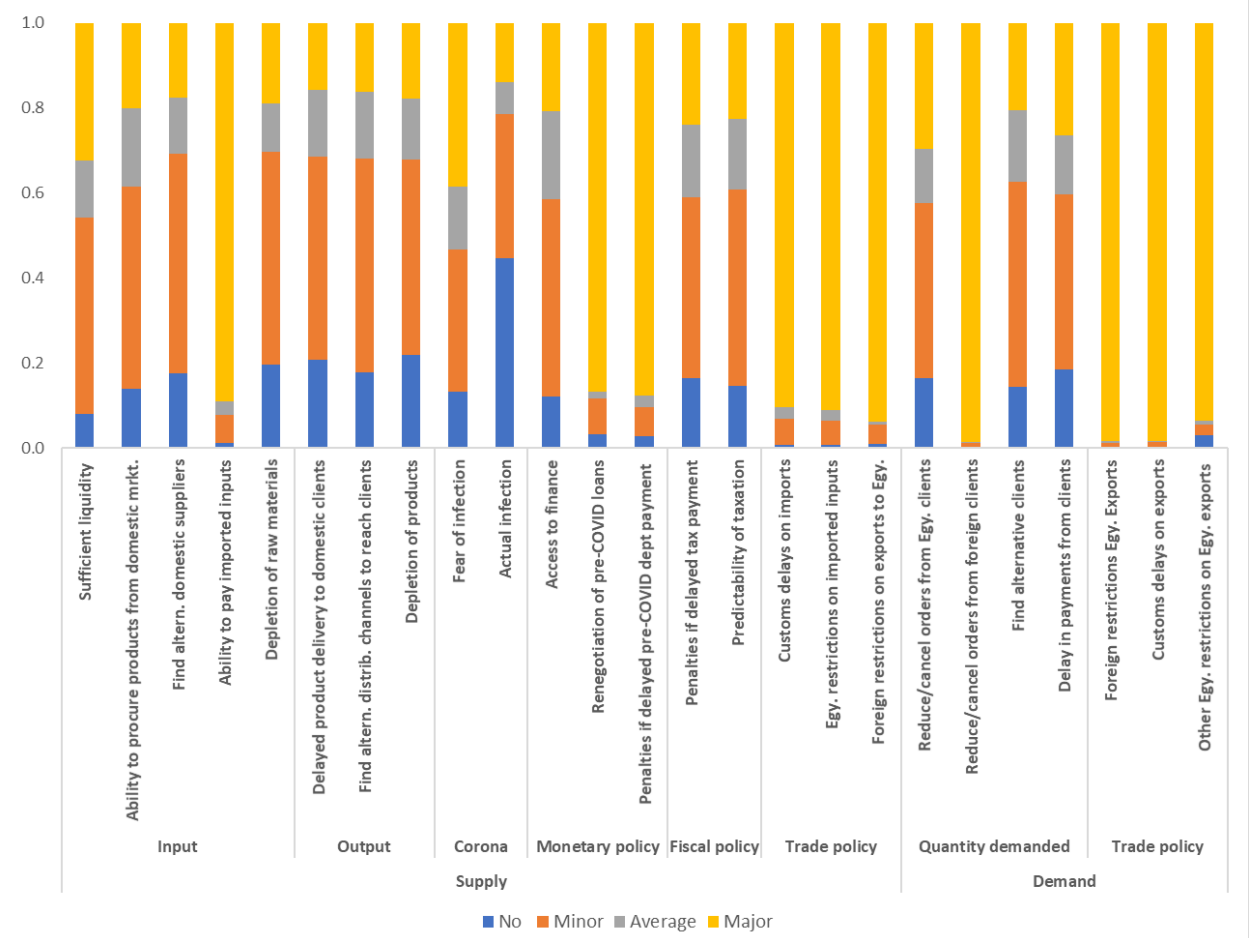
Demand-related channels are disruptions that have affected the demand a firm faces. First, are those directly affecting the quantity demanded, namely reductions and cancellations of orders from either Egyptian or foreign clients, the inability to find alternative clients in the short run, and delays in receiving client payments? Second, are either Egyptian or foreign partner countries' *trade policies* that have imposed direct restrictions on a firm's ability to export; and customs delays at home that have caused delays in either the extensive or the intensive margin of a firm's exports? And while exporters are the only ones affected by demand side trade policies, supply side trade policies concern both exporters and those serving the domestic market. The latter maybe utilizing imported inputs for their production.

Most countries have instituted full or partial lock-down measures to save lives during the pandemic and have adopted a number of policies to deal with the crisis. These – despite induced by a global pandemic – have added to the earlier embraced protectionist trade measures of the past decade. The aim of which was to secure availability of certain products to a country's people and to strengthen domestic industries at the expense of foreign ones. The pandemic induced tariff and non-tariff barriers to trade, this is in addition to the approximately 2000 contractionary trade measures already introduced between 2018 and 2019 (Evenett and Frits 2019).

[8] This captures the lockdown induced slump in supply and demand either voluntarily or involuntarily.

Figure 2 shows that the vast majority of firms[9] replied that trade restrictions – affecting both firm supply and demand - have been indeed the major transmission channel of the crisis.[10] Similarly, nearly all firms (98%) have indicated that cancelled and reduced orders from foreign clients were a major problem during the crisis (~88% of all exporting firms). For the full sample, these seven channels are followed by monetary policy affecting product supply. In particular, delayed debt installment and service payments and problems related to renegotiating pre-COVID loans.

Figure 2: Transmission Channels (share of firms indicating the severity of the problem from firms answering the question)



Source: Authors' own elaboration using the EIFBS data.
Note: All calculations are weighted using sampling weights.

Table 1 shows the difference between the average response to the COVID shock of non-GVC firms and GVC moderate (1st column) and GVC strict (2nd column) compared to non-GVC firms. If this difference is positive and significant, then non-GVC firms are more affected by the

[9] Over 90% of firms that have respondent to the respective transmission channel.
[10] With over 95% of all firms pointing to the constraints imposed by trade policies affecting the demand side, these represent the strongest transmission channel followed by those affecting the supply side (above 90% of all firms).

respective transmission channel than their GVC counterparts. The larger the coefficient the greater this difference. One would expect that firms engaged in GVCs would be the most exposed especially to the global protectionist trade measures. Contrary to expectations, Table 1 shows that firms that are part of GVCs were less affected by almost all transmission channels compared to their non-GVC counterparts. Firms under the stricter GVC definition are even less affected than those under the moderate definition.[11] We argue that since these firms are more productive and profitable, they are more resourceful and more networked, and so more resilient in the face of negative shocks, even trade related ones.

Table 1: Difference between GVC and non GVC Firms

			GVC moderate	GVC strict
Supply	Input	Sufficient liquidity	0.295***	0.472***
		Ability to procure products from domestic market	0.159**	0.333**
		Find alternative domestic suppliers	-0.0132	0.124
		Ability to pay imported inputs	1.304***	1.350***
		Depletion of raw materials	0.139*	0.311**
	Output	Delayed product delivery to domestic clients	-0.0686	0.0512
		Find alternative distribution channels to reach clients	0.0805	0.0879
		Depletion of products	0.161**	0.402***
	Corona	Fear of infection	-0.0115	-0.0448
		Actual infection	0.148*	0.0426
	Monetary policy	Access to finance	0.155**	0.399***
		Renegotiation of pre-COVID loans	0.388***	0.348***
		Penalties if delayed pre-COVID debt payment	0.379***	0.460***
	Fiscal policy	Penalties if delayed tax payment	0.128*	0.325**
		Predictability of taxation	0.0937	0.345**
	Trade policy	Customs delays on imports	1.162***	1.092***
		Egyptian restrictions on imported inputs	1.265***	1.171***
		Foreign restrictions on exports to Egypt	1.270***	1.297***
Demand	Quantity demanded	Reduce/cancel orders from Egyptian clients	0.076	0.281*
		Reduce/cancel orders from foreign clients	1.113***	1.233***
		Find alternative clients	0.0458	0.245*
		Delay in payments from clients	0.0638	0.163
	Trade policy	Foreign restrictions on Egyptian Exports	1.316***	1.241***
		Customs delays on exports	1.254***	1.167***
		Other Egyptian restrictions on Egyptian exports	1.138***	0.974***

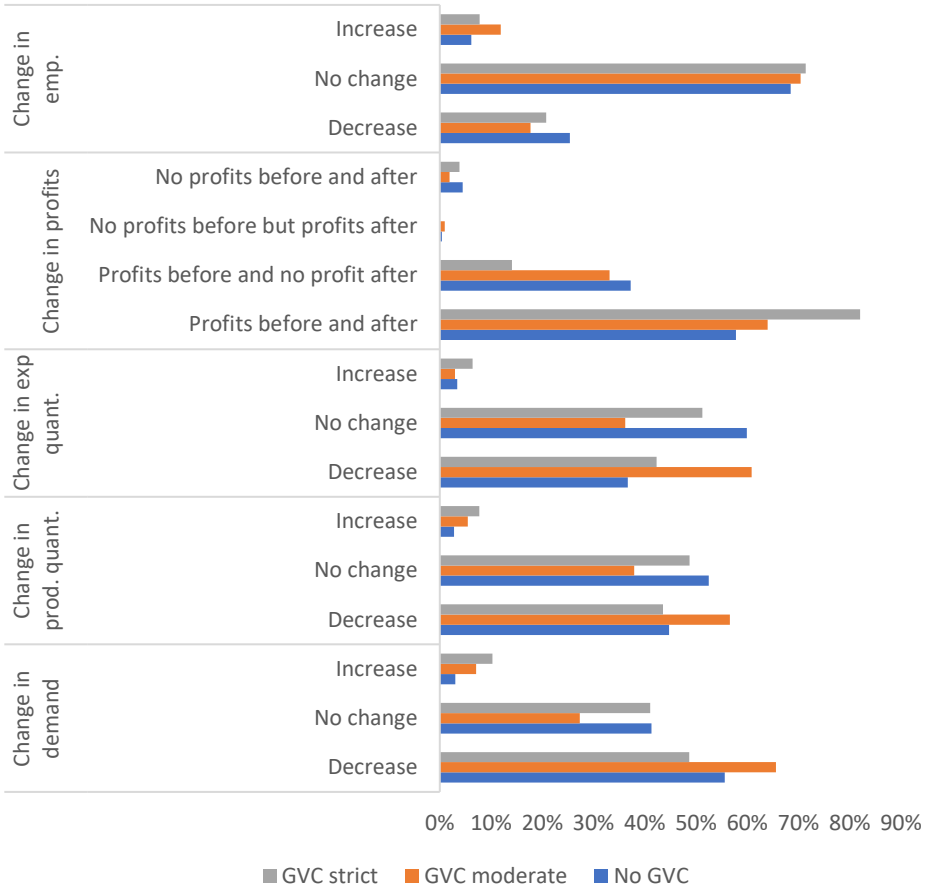
Notes: (i) *** p<0.01, ** p<0.05, * p<0.1. (ii) These figures represent the difference between the average response of non-GVC firms and GVC moderate (1st column) and GVC strict (2nd column).

GVC affiliated firms' relatively limited exposure is reflected in their relatively better crisis-related performance indicators compared to their non-GVC counterparts. Figure 3 shows that a

[11] They have consistently larger coefficient values (see columns 1 and 2 of Table 1).

substantially larger share of GVC firms have made profits both before and after the pandemic compared to the share of their non-GVC comparators. Similarly, a smaller share of them has failed to be profitable post-pandemic.

Figure 3: Performance variables of GVC vs. non-GVC firms



Source: Authors' own elaboration using the EIFBS.
Notes: (i) GVC moderate is defined as a firm that exports and imports. (ii) GVC strict is defined as a firm that exports, imports, has an international certification and foreign ownership.

Increases in employment for GVC firms have been more, and losses less, probably on account of more decent contractual labor arrangements. Increases in exports and in production more generally have been greater for GVC firms. Reductions in both have been greater for moderate GVCs compared to either strict GVC affiliated or non-GVC firms. Firms in GVCs with foreign ownership components have greater resilience, as shown in factors such as better connections and production networks to ease trade within a restrictive system. They are also substantially larger in size compared to their moderate GVC affiliated counterparts.[12]

[12] While 98% of all moderately GVC affiliated firms are large (>100 worker, 83%) and medium-sized (20<X <99, 16%), all firms of the stricter definition - with no exception - fall under these two larger size categories (92.5% large and just 7.5% medium).

On the other hand the trade of moderate GVC firms, those that just import and export without the backing of a foreign share, was directly hit by the newly imposed trade barriers harder than firms that only cater for the domestic market. Table A2 in the Annex runs regressions to more systematically establish the link between GVC participation and performance.[13] We find a positive association between the strict definition of GVC and the increase in profits after the pandemic and the quantity of exports. Similarly, the moderate definition of GVC is positively correlated with an increase in the value of exports, the value of production and employment. Thus, generally, GVC firms are performing better than their non-GVC counterparts.

4. Conclusion

The COVID pandemic created a global demand and supply shock which shook global trade. Egypt was no exception to this trend. This 'greater trade collapse' of 2020 - as it has been called (Baldwin and Evenett 2020) - manifested itself in a severe decline in Egyptian exports and imports. Given their greater integration into the global economy, firms that are part of Global Value Chains (GVCs) are expected to be more exposed and vulnerable to this predominately external shock. We show that trade policies of the 'great lockdown' have indeed been the main transmission channel of this crisis. Yet, this is so for *all* types of firms with no exception. Firms affiliated with GVCs have reported a smaller negative impact of this channel compared to their non-GVC counterparts. Moreover, on account of being more productive these firms have also shown superior post-pandemic performance. There are some nuances: firms that are part of the stricter definition of GVCs consistently demonstrate both greater resilience and better performance compared to those weakly linked to them, i.e. what we call here moderate GVCs.

What do we take away from these results? There has been a rise in defensive nationalism - from closing borders, to building walls, to imposing thousands of contractionary trade and FDI measures - already for a decade before the start of the pandemic. An additional round of protectionist measures were imposed in the wake of the pandemic. But have these measures been useful even to the national firms themselves these policies claim to be serving? Our results have clearly shown that these policies have backfired in the face of the least exposed firms, such as those that either solely serve the domestic market or those that don't use imported inputs. Such policies exacerbate shortages and cause prices to rise. Only the most productive firms – those with the greatest global links – have possessed the means to withstand the negative implications of pandemic induced protectionist policies. This finding is in line with both pre and post-COVID literature pointing to the fact that turning inward and impeding global integration does not work (cf. Boranova et al. 2022; Baldwin and Evenett 2020; Miroudot and Nordström 2020; Evenett

[13] There had also been post-COVID government support. In terms of GVC versus non-GVC, government support went chiefly to non-GVC firms, specifically 98.3% (moderate) and 99.7% (strict) of all post-COVID government support went to the non-GVC counterparts, making it less likely that government support is the cause of superior performance. El-Haddad and Zaki (2023b) show in fact, that younger and smaller firms have made better use of this support.

2019; Eventte and Fritz 2019; Gereffi 2018; Agostino et al. 2015; Backer and Flaig 2017; Floria and Giunta 2011 and many more). Instead, it backfires and delays recovery. America first, China first, India first and Egypt first policies will harm not only global welfare but most importantly the weakest firms – those governments actually say they intend to protect.

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Annex

Table A1: Characteristics by type of GVC Participation

		GVC simple			GVC complex		
		Mean	Min	Max	Mean	Min	Max
	Cap. Prod.	1466.5	0.0	1200000.0	1366.2	0.0	1200000.0
	Lab. Prod.	1530163.0	18.5	595000000.0	1457836.0	18.5	595000000.0
	Age	25.64	2	201	25.76	2	201
	Ln(Age)	2.9	0.0	5.3	2.9	0.0	5.3
	Educ.	2.7	1.0	4.0	2.7	1.0	4.0
No GVC	Ln(Emp. BC)	4.0	0.0	8.9	4.2	0.0	9.6
	Cap. Prod.	2094.9	0.0	540000.0	7877.6	0.4	540000.0
	Lab. Prod.	1230984.0	1000.0	60300000.0	2254520.0	14000.0	36000000.0
	Age	26.41	3	123	26.86	3	121
	Ln(Age)	3.0	0.7	4.8	3.1	0.7	4.8
	Educ.	3.1	2.0	4.0	3.1	2.0	4.0
GVC	Ln(Emp. BC)	5.6	2.1	9.6	6.2	3.0	9.5

Source: Authors' own elaboration.

Table A2: GVC Participation and Performance Variables

	Inc. Empl.	Inc. Exp. Quant.	Inc Prod. Quant.	Inc. Demand	Inc. Prod. Value	Inc. Exp. Value	Profits After
GVC moderate	0.218*	0.359*	-0.103	0.0221	0.177*	0.949***	0.133
	(0.112)	(0.192)	(0.142)	(0.137)	(0.0988)	(0.132)	(0.0848)
GVC strict	-0.144	0.561**	-0.108	0.139	-0.118	0.268	0.497***
	(0.229)	(0.267)	(0.234)	(0.217)	(0.193)	(0.271)	(0.176)
Large	0.0994	0.758***	0.579***	0.465***	0.244***	0.365***	0.417***
	(0.0919)	(0.211)	(0.109)	(0.111)	(0.0789)	(0.139)	(0.0620)
Private	0.107	0.202	-0.124	-0.255*	-0.0799	0.435	-0.207**
	(0.154)	(0.307)	(0.156)	(0.145)	(0.126)	(0.296)	(0.104)
Ln(Age)	0.0472	-0.0877	-0.0702	-0.0237	0.0231	-0.0976	-0.0900**
	(0.0587)	(0.117)	(0.0670)	(0.0675)	(0.0491)	(0.0892)	(0.0369)
Indus. Zone	0.227**	-0.0204	0.224**	0.000882	0.337***	0.475***	0.138**
	(0.0917)	(0.178)	(0.108)	(0.108)	(0.0797)	(0.147)	(0.0602)
Constant	-1.947***	-2.541***	-1.637***	-1.561***	-1.531***	-2.521***	0.977***
	(0.253)	(0.501)	(0.271)	(0.266)	(0.208)	(0.419)	(0.159)
Observations	2,297	1,865	2,310	2,259	2,352	2,251	2,372
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Regressions are run using a probit model where the dependent variable is a dummy variable that takes the value of 1 if the performance variable increased after COVID and zero otherwise. Standard errors in parentheses. Inc. refers to increase. *** p<0.01, ** p<0.05, * p<0.1.