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Role of Global Value Chains and Exchange Rate: An Empirical Examination in case of Pakistan

Asif Mahmood* and Muhammad Awais Zahoor†

Abstract

Pakistan's economy has a history of facing continuous external sector shocks that often resulted in large exchange rate depreciations. Whether these depreciations have supported growth in exports from Pakistan or do more harm than providing any benefit to the economy is always a matter of domestic debate with inconclusive results. One major apprehension sighted in this regard is the role of intermediate imported goods that become expensive after depreciations and thus offset any competitive gains expected to be achieved from the exchange rate adjustment. To empirically investigate this argument, we evaluate that whether and how the Global Value Chains (GVCs) participation, i.e. the export and import of intermediate goods, affects the REER elasticity for exports in Pakistan using input-output model techniques. We find that, like elsewhere, REER elasticity of exports has declined in Pakistan overtime. However, only around 16 percent of this decline in REER elasticity is explained by the role of GVCs participation. One major reason for this lower impact could be coming from the fact that, unlike other emerging economies and in contrast to general perception, role of backward participation (i.e. use of imported inputs to produce exports) is one of the lowest in Pakistan. While the results still signify the role of PKR exchange rate in external adjustment, the low backward participation is not helping the exports to become competitive overtime.

JEL Classification Numbers: F14, F31, F41

Keywords: Real Exchange Rate, Export Growth, Global Value Chains

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I. Introduction

In the last three decades, international trade has been increasingly structured with different stages of production distributed across different economies, commonly known as global value chains (GVCs). This has happened because the advances in information and transportation technologies as well as falling trade barriers over the last three decades have allowed firms, particularly from the advanced economies, to unbundle production into tasks performed at different locations, such as in emerging and developing economies. This in-turn helps them to take advantage of relatively lower factor cost existing in emerging economies. On the other hand, connecting with firms from advanced economies allows emerging markets, for instance, to benefit from their sophisticated technologies and know-how. Conditional evidence for such a positive impact of GVCs participation in emerging and developing countries is presented in Kummritz (2016) and UNCTAD (2013).

The increasing role of the GVCs, however, has renewed the debate on the conventional role of exchange rate in influencing the global trade flows.¹ Specifically, traditional theoretical models predict that currency changes pass through into consumer prices. A domestic depreciation reduces export prices in a foreign currency and increases import prices in the domestic currency, which leads to more exports and less imports. This is known as the expenditure-switching effect of a currency depreciation (Obstfeld and Rogoff 2007). Similarly, Bussière et al. (2016) argue that exchange rate changes can play an important role in addressing global trade imbalances by estimating trade elasticities for 40 major economies. In contrast to these results, emerging literature, suggests that the increasing participation of firms in GVCs has reduced the relevance of exchange rate movements for trade flows across many major economies [see for example, Ollivaud et al. (2015) and Georgiadis (2019)].

Integration into the GVCs can potentially affect the traditional expenditure switching mechanism of changes in exchange rate through two important channels. First, the use of imported intermediate inputs by countries in their exports (also known as backward GVC integration) can lower the sensitivity of export flows to exchange rate movements, such as depreciation, because it causes trade prices and marginal costs to increase in tandem. Second, with GVC integration through forward linkages (i.e. export of intermediate inputs to third countries), the weaker local currency enhances the competitiveness of exported goods, which in-turn increasing the demand for imported inputs needed to produce them and thereby countering the conventional expenditure switching effect in response to currency depreciation.

The developments related to country's trade in the GVCs and a credible information on the role exchange rate in impacting the trade flows is important for the formulation of national

¹ Here and elsewhere in this paper, discussion on exchange rate refers to the role of real exchange rate – i.e. nominal exchange rate deflated by the relative prices, until otherwise indicated.

economic policies. Such a disconnect could make exchange rate less effective in absorbing external shocks. This could have profound policy implications, particularly in case of emerging and developing economies. Moreover, the disconnect could weaken a key channel for the transmission of domestic monetary policy by reducing the boost to exports that comes with exchange rate depreciation when the central bank eases its monetary policy stance. It could also complicate the resolution of country's trade imbalances via the adjustment of relative trade prices.

Pakistan, being a small open emerging economy, has a history of facing continuous external sector shocks that resulted in large exchange rate depreciations. This trend could be judged from the fact that the country had to resort to the emergency lending from the IMF for 23 times since its independence.² Most of these episodes of exchange rate depreciations preceded by widening current account deficits amidst higher growth momentum, which had been largely fueled by stable or fixed nominal exchange rate mechanism. The obsession with latter policy perseverance by policymakers could be characterized around the notion of fear of floating, whereby a depreciation in exchange rate would do more harm than providing any benefit to the economy or to common citizens. This impression overtime became stronger as country's exports broadly remained on lower side even after the episodes of large exchange rate depreciations [see for example, Khan and zaman (2013), Yasmeen et al. (2018) and Hina (2020)].

In this backdrop, the objective of this paper is to revisit the role of exchange rate in influencing trade flows in case of Pakistan, particularly in the context of country's integration in the GVCs. To determine this, we employ an extensive input-output model techniques using the latest estimated tables from the Eora multi-regional global input-output database to assess the Pakistan's position in the GVC. In the first step, we simply analyze how the elasticity of exports from Pakistan to the standard real effective exchange rate (REER) has changed over time. Second, we investigate how the country's participation in GVCs has affected this relationship. Particularly for second step, we use two measures of GVC integration developed by Koopman et al. (2010) - forward and backward participation. As highlighted, the higher participation in the GVC is expected to lower the REER elasticity of exports because both backward and forward linkages should mute the competitiveness gains of a currency depreciation.

Preliminary results suggest that the REER elasticity of exports in Pakistan has moderately decreased overtime due to participation in the GVCs. Specifically, the REER elasticity of gross real exports fell in absolute value from an average of 1.16 at the beginning of the period to 0.64 at the end of the period. Around 15 percent of this fall in REER elasticity of exports is explained by country's participation in the GVC. Moreover, the decrease in REER elasticity to exports in Pakistan has been predominantly on account of country's increasing forward linkages in the GVCs rather than the backward linkages. This inference is broadly in contrast to evidence find in other regional and emerging economies, where imported inputs played an important role in manufacturing exports, and thereby having a considerable effect of GVC participation on REER elasticity. Overall,

² This included the country's ongoing IMF EFF program and RFI support received during the Coronavirus pandemic. Moreover, out of Pakistan's 23 total arrangements with the IMF, 12 arrangements took place in the last three decades.

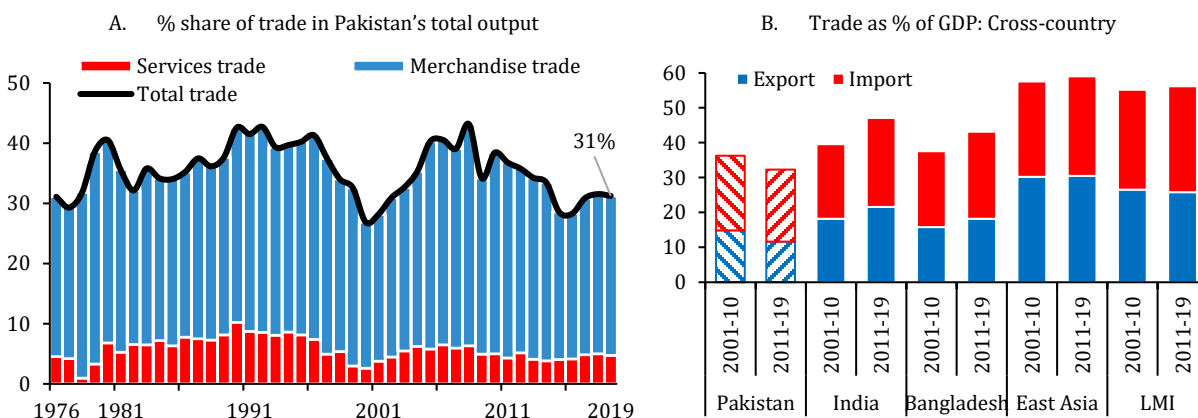
the results highlighted the uncompetitive structure of Pakistan’s economy where exports continued to be dominated by low-value added and primary products.

The rest of the paper is organized as follows: Section II provides stylized facts on Pakistan trade structure and exchange rate developments in the last three decades. Section III highlights the evolution of country’s role in the GVCs. Section IV describes the empirical strategy to investigate the role of exchange rate and GVC for external trade. Section V presents the results from the empirical examination, while section VI make the concluding remarks.

II. Stylized facts on Pakistan’s external trade and exchange rate

Pakistan is a small open emerging economy where total trade – including merchandise and services – account for 31 percent of country’s total output in 2019. Though this level has been on decline in recent years after peaked around 43 percent in 2008. Figure 1 shows that the variation in total trade is broadly coming from changes in the pattern of merchandize trade, which on average accounts for 85 percent of country’s total trade. Moreover, in cross-country perspective, Pakistan is significantly lagging behind its regional and peer competitors in terms of integration with the outside world. In particular, the role of exports is relatively quite low in Pakistan when compared to peer countries. In a broader perspective, the declining share of exports in total output indicates the country’s overall weakening competitiveness overtime.³

Figure 1: Trend in Pakistan’s trade openness and cross-country comparison



Sources: WDI-WB, SBP staff estimates

Note: LMI = low middle income country group as per World Bank definition

In terms of trade structure, there has been no visible change occurred in exports from Pakistan during the last two decades. Country’s major exports include consumer items like low-tech textile items including readymade garments, hosiery and other knit wears along with primary food items like rice and spices (Figure 2, Panel A). This element highlights the existence of product cycles of exportable goods that have surpassed their comparatively beneficial age.⁴ Consequently, marginal but unsustainable gains in exports receipts are generated either due to favorable

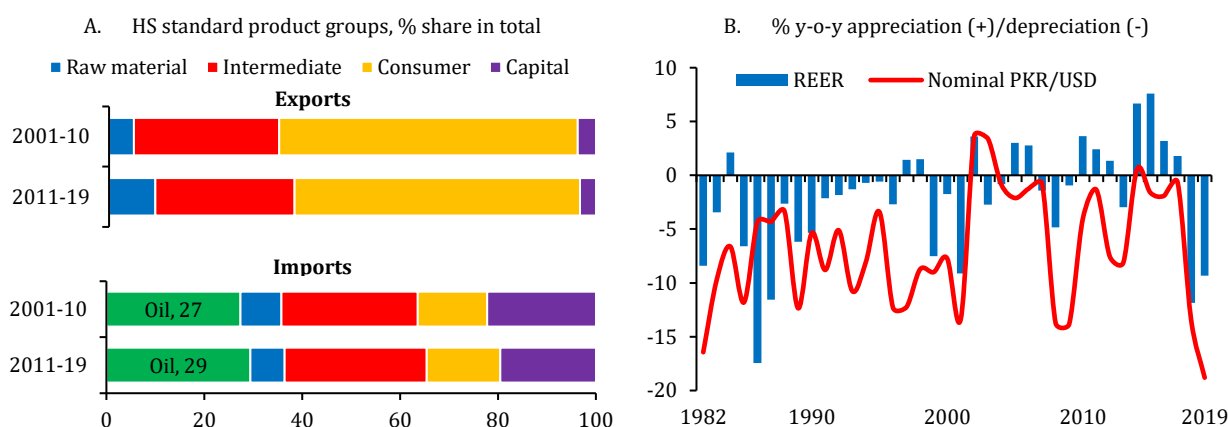
³ See Figure A1 in Annexure

⁴ For detailed analysis on Pakistan’s recent export performance, see SBP (2015 and 2019) and Mahmood and Ahmed (2017).

international prices or elevated surplus in domestic production. Major intermediate exports from Pakistan consists of cotton yarn, Portland cement, and chemicals while country's major capital exports are made-up of surgical instruments and small machinery.

Like exports, composition of imports has also remained unchanged in the past two decades. Country's dependence on imported fuel has slightly amplified in recent years, explaining the increasing role of liquefied natural gas (LNG) in overall energy mix. In case of non-oil imports, intermediate goods, including chemicals and steel, make the largest portion (Figure 2, Panel A). This followed by capital imports like mobile phones, solar panels and machinery. Consumer imports mostly consist of processed food stuff while import of raw materials is mostly made-up of raw cotton and steel scrap, which in-turn reflecting the dismal situation in local production of both items in the last decade.

Figure 2: Pakistan's external trade structure and trend in PKR exchange rate



Sources: ITC, WITS, SBP staff estimates

Note: In panel A, oil exports from Pakistan have been made part of raw materials due to their nominal share in total exports.

RERR = trade-weighted real effective exchange rate against the 37 basket currencies.

Regarding exchange rate management, historically, the trend suggests that there has been a significant number of episodes where Pakistan has deviated from its official stance on foreign exchange regime as compared to its market practices. After independence in August 1947, Pakistan officially followed fixed exchange rate regime till 1981. Since the beginning of 1982, the country has been following a *de jure* floating exchange rate regime, though with different level of intensities. However, the comparison of *de jure* and *de facto*, i.e. the actual market practices performed by the central bank, suggests that implemented regime has mostly been different from the communicated one.⁵ This situation has not only created credibility challenges but often led to mis-alignment of PKR, mostly in the form of an overvaluation, for an extended period that generally ended up in large PKR depreciations, both in real and nominal terms (Figure 2, Panel B).

Like elsewhere, the empirical results regarding the role of exchanger rate in determining trade balance in Pakistan broadly remains inconclusive. There is a vast amount of empirical literature available on Pakistan which focuses on the role of PKR in affecting the trade balance,

⁵ See Table A1 in Annexure.

specifically the exports and imports both at aggregated and disaggregated levels. In line with economic literature, most of these studies used PKR real exchange rate to determine the sensitivity of export and import flows. In case of export demand, the empirical result indicates price elasticity in the range of 0.30 to 0.88, while for import demand, the price elasticity ranged from 0.23 to 0.89 across the studies presented in Table 1.

Table 1: Estimated export and import elasticities for Pakistan w.r.t. changes in real exchange rate

Study	Sample period	Export	Import
Hasan and Khan (1994)	1983Q1-1993Q3	-0.32	0.78
Aftab and Khan (2002)	1980Q1-2000Q4	-0.62	0.87
Atique and Ahmad (2003)	1972-2000	-0.49	
Kemal and Qadir (2005)	1981-2003	-0.66	0.52
Felipe et al. (2009)	1980-2007	-0.34	0.24
Rasheed and Mukhtar (2010)	1972Q1-2006Q4		0.89
Tokarick (2010)	2001-2004	-0.88	0.84
Baluch and Bukhari (2012)	1971-2009		0.53
Khan et al. (2013)	1981-2010	-0.86	
Bano et al. (2014)	1980-2010	-0.30	0.53
Khan et al. (2016)	1981-2010	-0.42	0.34
Ishtiaq et al. (2016)	1970Q1-2012Q4	-0.31	0.78
Yasmeen et al. (2018)	1980-2016	-0.80	0.23
Bukhari et al. (2019)	1990Q1-2017Q2	-0.68	0.28
Hina (2020)	1982-2019	-0.53	0.47

Note: In case of PKR depreciation, negative (positive) price elasticity for exports (imports) indicate a positive (negative) effect on export (import) volumes. Furthermore, the estimated elasticities are for long-run and based on both bilateral and trade-weighted real exchange rate for PKR.

Overall, the research indicates that the impact of changes in PKR exchange rate in influencing trade balance is limited in case of Pakistan. To this effect, several factors have been identified across studies that may influence or tamper the exchange rate elasticity for exports and imports from Pakistan. For exports, factors like the narrow export base due to the existence of primary and non-sophisticated products, absence of branding culture, higher tariff on inputs, unskilled labour force, and the most important, presence of considerable imported content in making exports are usually highlighted as responsible for making changes in PKR exchange rate less effective. In case of imports, reliance on imported machinery, fuel, industrial chemicals and some major food items are often described as making imports to Pakistan relatively inelastic to changes in exchange rate. Given the scope of this paper, the next section will discuss the importance of Pakistan's trade in intermediate goods, particularly in the context of GVCs.

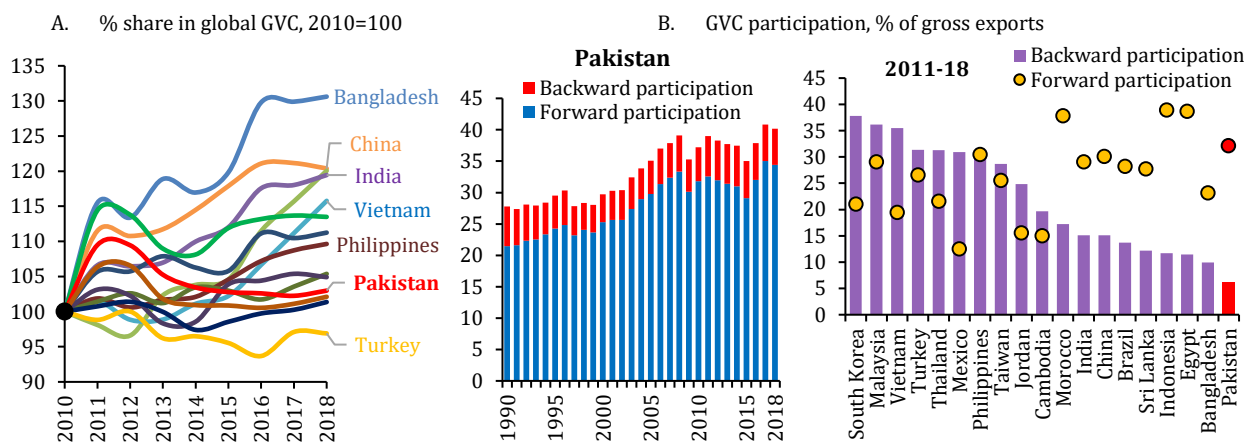
III. Measures of GVC integration and Pakistan's position

As highlighted earlier, the core notion of GVCs is the location of different stages of the production process across multiple countries. In this process, due to fragmentation of production network, intermediate goods cross borders several times along the chain, often passing through many countries more than once. The implication of such fragmentation is that gross trade flows from traditional trade statistics no longer provide an adequate measure for understanding

domestic value added and national income. To overcome this problem, researchers mostly rely on multi-region input-output tables that can be used to derive data on the value added by each country in the GVCs. To measure this for Pakistan, we follow Koopman et al. (2014) to obtain required indicators of GVC integration using the Eora multi-region global input-output database.⁶

Evidence indicates that, Pakistan’s integration into the GVCs has remained limited in the recent years; reflecting the overall decrease in country’s trade openness. This trend is almost opposite to the developments observed in other regional and peer economies, particularly those competing in textile exports (Figure 3, Panel A). For example, Bangladesh trade in GVC has increased by around 30 percent since the global financial crisis of 2007-09. India’s share has also increased exponentially in the same period. In contrast, Pakistan’s share in world GVC trade has remained almost flat in recent years. This trend is consistent with the fact that Pakistan’s overall trade openness has declined by substantial 14 percentage points in proportion to its output since the global financial crisis of 2007-09.

Figure 3: Integration into the GVCs - Pakistan and cross-country comparison



Sources: UNCTAD, Eora, SBP staff estimates

Note: LMI = low middle income country group as per World Bank definition

Interestingly, unlike other regional and peer economies where backward integration plays an important role, Pakistan’s integration in the GVCs is largely happening through forward linkages. This unusual evidence of low backward participation, i.e. the use of intermediate imports to produce exports in Pakistan, is not only against the earlier empirical results found in Bader (2006) but also in contrast to general perception among both public and private sector stakeholders. Anecdotal evidence suggests that this low backward participation in GVCs is one of the main reasons for Pakistan’s dismal export performance relative to its peer countries, particularly during the last two decades. On the other hand, Pakistan is better integrated than its peers as a seller, i.e. forward participant, of inputs into GVCs (Figure 3, Panel B). To analyze the implications for the role of exchange rate due to Pakistan’s participation in GVCs, the next section will present empirical investigation and discuss the results obtain in this regard.

⁶ See Figure A2 in Annexure detailing how value added exports are calculated from gross exports.

IV. Empirical framework and preliminary results

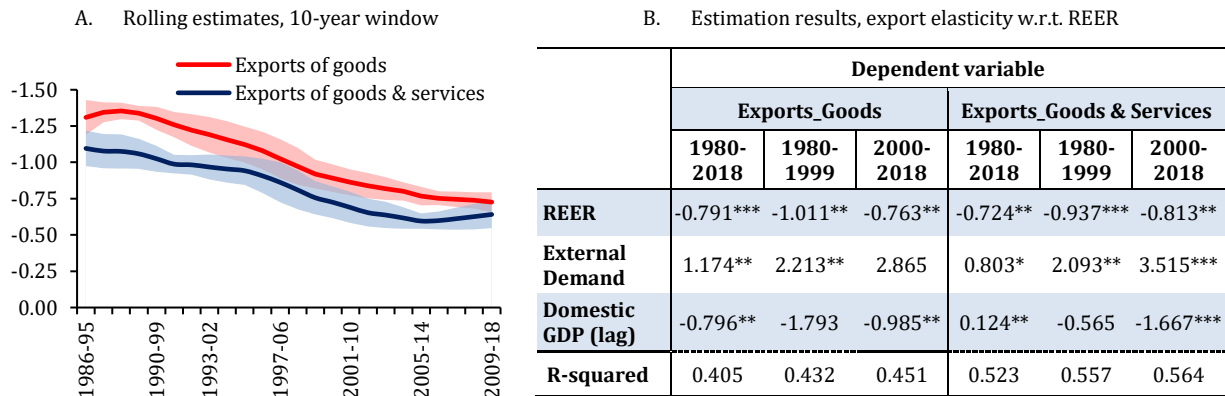
Given the scope of GVCs is mostly revolving around the concept of exports from different dimensions, the literature mostly focuses on exchange rate elasticity of exports. As highlighted earlier and being at the center of debate, the scope of this analysis is also limited to determine the altering effects of participation in GVCs on exchange rate elasticity of exports in case of Pakistan. To perform this analysis, we used annual data for the period 1980-2018. The choice of the period of analysis is determined by the availability of data on trade in value added from the Eora database. Data for export volumes, real effective exchange rate (REER), and external and domestic demand indicators are sourced from IMF and World Bank databases.

Before examining the implications of GVC on export elasticity, it's important to first estimate the export demand model to determine the REER elasticity of exports overtime. For this purpose, we estimated the following standard regression specification used across various studies:

$$\Delta \ln Export_t = \alpha + \beta \Delta \ln REER_t + \gamma Control_t + \varepsilon_t \quad (1)$$

where $\Delta \ln Export_t$ denotes change in real exports at time t , $\Delta \ln REER_t$ is the change in REER as positive change indicate real appreciation while negative change shows real depreciation of PKR at time t . For exports, we alternately used both goods exports (i.e. export quantum) and combined series of real exports of goods and services (from the national accounts) as a dependent variable. The coefficient β captures the effect of change in REER on export volumes. For $Control_t$ variables, we specifically used initial conditions by including lagged domestic GDP and export-weighted GDP of Pakistan's main trading partners to control for external demand.

Figure 4: Export elasticity w.r.t. PKR REER – Baseline empirical results for Pakistan



Source: SBP staff estimates

Note: In Panel B, shaded area around solid lines denote 90 percent confidence interval. In Panel B, *** p<0.01, ** p<0.05, * p<0.1

Results indicate that the REER elasticity for exports of both goods, and goods and services from Pakistan has decreased in the last three decades. Specifically, Panel A of Figure 4 shows that, on basis of rolling estimation, the REER elasticity for goods' exports has declined from -1.25 to -0.73 during 1986-2018. Similarly, REER elasticity for exports of both goods and services' decreased from -1.16 to -0.64 in the same period. Panel B of Figure 4 exhibits the change in REER elasticity for two sample periods. In case of exports of goods, the REER elasticity decreased by

around 25 percent from 1980-1999 to 2000-2018.⁷ Similarly, though with lower magnitude, the REER elasticity for exports of both goods and services decreased by 13 percent between two sample periods, while slightly increased in recent years.

Overtime, there could be several factors at play that caused the decline in PKR REER elasticity for exports, including the role of GVCs. However, this decline in REER elasticity is not unique to Pakistan as several other major advanced and emerging economies experienced such trend in recent decades due to global trade slowdown (Constantinescu et al. 2015). Furthermore, Brown and Crowley (2013) and Amity et al. (2014) documented the positive role of developments related to tariff barriers and exchange rate pass-through in decreasing the responsiveness of trade quantities to currency movements, particularly in the past two decades. Regarding the role of GVCs, among others, Adler et al. (2019) find the evidence that countries greater integration into GVCs reduces the exchange rate elasticity of gross trade volumes. However, their results also indicate that more integration into GVCs also amplify the effect of exchange rate changes. This in-turn reflects that the benefits of exchange rate flexibility in supporting external adjustment still holds.

Does Pakistan’s integration into the GVCs has also altered its REER elasticity for exports overtime? To answer this central question, we empirically investigated the role of country’s overall participation in GVCs and separate impact of both backward and forward participation on REER elasticity. The empirical model build on equation (1) where REER is interacted with constructed GVC variables. Like earlier estimations, we used both real exports of goods, and goods and services as a dependent variable. Table 2 present the results for the impact of GVC participation in altering PKR REER elasticity for exports.

Table 2: Export elasticity w.r.t. PKR REER – Impact of GVC participation

	Dependent variable					
	Exports_Goods			Exports_Goods & Services		
	(1)	(2)	(3)	(4)	(5)	(6)
REER	-0.791***	-0.934*	-1.218**	-0.724**	-0.845**	-1.079**
REER * GVC		0.004*			0.003***	
REER * BWP			0.007**			0.005*
REER * FWP			0.012			0.012**
R-squared	0.405	0.413	0.428	0.523	0.556	0.569

Source: SBP staff estimates

Note: *** p<0.01, ** p<0.05, * p<0.1; GVC = global value chains, BWP = backward participation in GVCs, FWP = forward participation in GVCs. All regressions included lag domestic GDP and export-weighted foreign GDP.

Results indicate that the GVC participation has lowered the REER elasticity to exports in Pakistan, though moderately. Specifically, for exports of goods, the PKR REER elasticity declined by 16 percent on average due to participation in the GVCs. For exports of both goods and services, the decline in REER elasticity is estimated to be around 13 percent on account of GVC participation.⁸ While direction of these results are broadly in line with other studies, the impact is

⁷ Preliminary diagnostics indicate no statistical evidence of a break in REER series.

⁸ If we adjust the slope estimated for the REER in column (2) of Table 2, -0.934, using the positive estimated slope on the interaction term for participation in GVCs, 0.004, and the average Pakistan’s participation in GVCs, 37.5 (percent of gross

quite moderate when compared to empirical results obtained for GVC participation from other emerging economies. As observed in columns (3) and (6), one main reason for this moderate impact of GVCs on PKR export elasticity could be judged from the fact that the country's backward integration (i.e. use of imported inputs to produce final exports) is one of the lowest among the emerging economies.

V. Conclusion

In Pakistan, despite several financial sector reforms in the past three decades, changes in exchange rate continued to play an important role in setting the overall direction of macroeconomic targets. In particular, the notion of PKR exchange rate depreciation is still largely considered as a reflection of weak economy among major stakeholders. Specifically from the manufacturing perspective, there appears to be a concern that PKR depreciation would increase the imported cost of intermediate goods needed to produce exports, which possibly offset any competitive gains achieved from such exchange rate policy. In empirical sense, like evidence suggested in case of many East Asia economies, these developments could have potentially lower the real exchange rate elasticity to exports in Pakistan as well. In this paper, we empirically investigated that whether and how the GVC participation, i.e. the export and import of intermediate goods, affects the REER elasticity for exports in Pakistan, using Eora multi-region global input-output database.

Our findings do indicate that the REER elasticity of exports has declined overtime in Pakistan, which is in line with evidences found in many other emerging and developing economies. Moreover, Pakistan's integration into the global GVCs has also gradually increased in the last two decades, though become flat in recent years. Surprisingly, the integration is more in terms of forward linkages rather than backward linkages, which is more common in case of regional and other peer economies. Overall, the empirical results suggest that around 16 percent of the total decline in REER elasticity is explained by Pakistan's GVC related participation. This impact is quite low in magnitude when compared to results from other economies, and highlights the relatively lower backward participation, which is often considered more important for producing high quality export goods.

Overall, our results indicate that the notion that PKR depreciation increased the imported cost of intermediate to produce exports in Pakistan is largely exaggerated. Having said this, learning from regional and peer economies, it is important for a country like Pakistan to increase its backward participation in the GVCs in order to remain competitive. This will help improve the country's overall economic outlook.

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exports), we have a predictive elasticity of -0.784 ($-0.934 + 0.004 \times 37.5 = -0.784$). This is quite close to baseline REER elasticity in column (1) of Table 2. For quantification of GVC impact on REER elasticity, for example in case of exports of goods, we can see in columns (2) that with no participation in GVCs, REER elasticity is estimated at -0.934 . Therefore, on average, GVC participation reduces REER elasticity by approximately 16 percent $[(-0.934 + 0.791)/-0.934]$.

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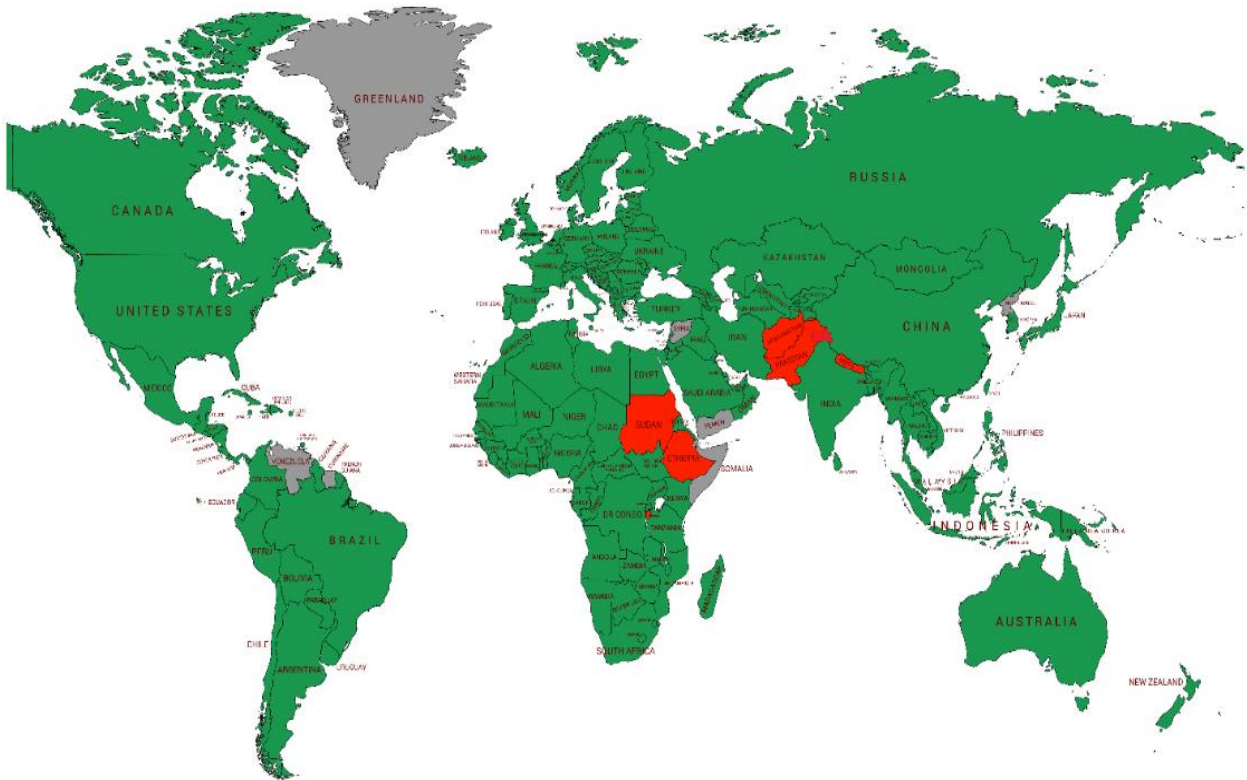
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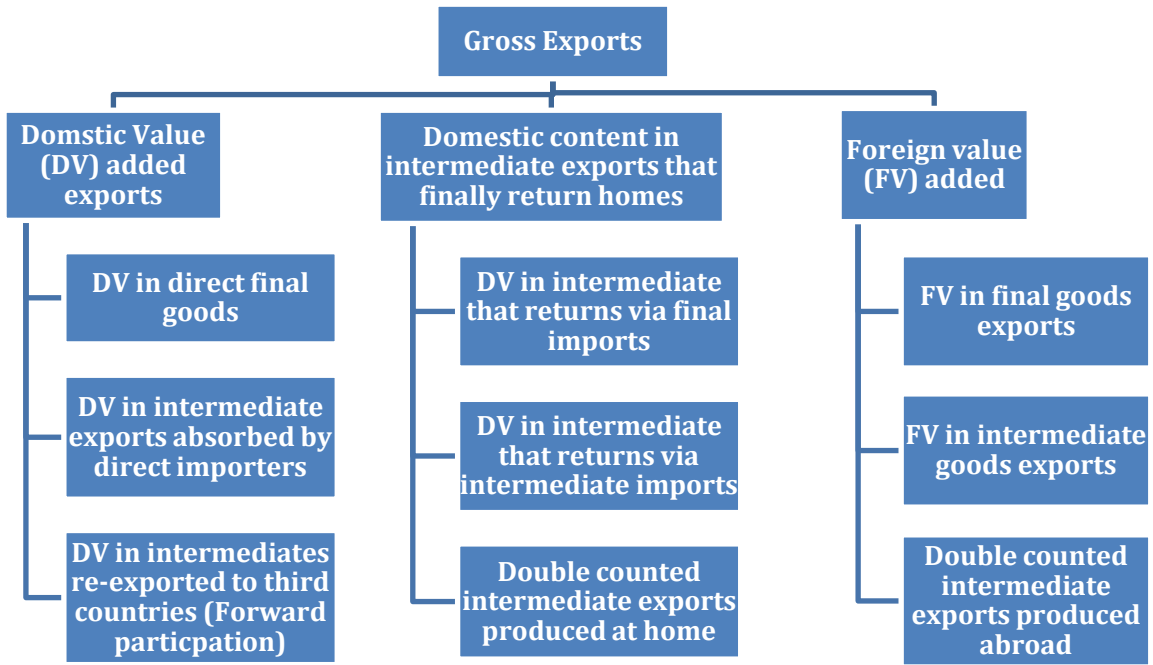
Annexure

Figure A1: Export of Goods & Services, as % of GDP



Note: **Red** countries having exports-to-GDP ratio less than 10 percent in 2018
Source: WDI, Authors' estimates

Figure A2: Decomposition of Gross Exports



Source: Koopman et al. (2014)

Table A1: Historical Exchange Rate Regimes in Pakistan

Official (<i>de jure</i>) Exchange Rate Regime	From	To
Fixed against USD at PKR/USD 3.3085	1948	31st July 1955
Fixed against USD at PKR/USD 4.7697	1st August 1955	10th May 1972
Fixed against USD at PKR/USD 11.0078	11th May 1972	15th February 1973
Fixed against USD at PKR/USD 9.9078	16th February 1973	7th January 1982
Managed float	8th January 1982	18th July 1998
Fixed/Dual exchange rate	21st July 1998	18 th May 1999
Floating	19 th May 1999	-
IMF <i>de facto</i> classification of Pakistan's exchange rate regime	<i>as of April 30</i>	
Conventional pegged arrangement	1999, 2005, 2006	
Managed floating with no predetermined path for the exchange rate	2000, 2001, 2002, 2003, 2004, 2007	
Floating	2008, 2009, 2011, 2012	
Stabilized arrangement	2010, 2016, 2017, 2018	
Other managed arrangement	2013, 2014, 2015, 2019	

Source: SBP, IMF