'Atmanirbhar Bharat Abhiyan'
A Smooth Drive to Self-reliance?

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Over the last two decades, India's participation in global value chains and international production networks have improved, but the domestic value added embodied in gross exports has exhibited a fluctuating trend. In 2020, India launched the "Atmanirbhar Bharat Abhiyan," where enhancement of the DVA content of exports can be considered as an underlying objective. The impact of various factors of production and other drivers on India's DVA content in select manufacturing exports have been identified in this paper with help of trade in value added data for 2000–18. The empirical results indicate that the focus on export and FDI promotion policies by itself will not lead to either self-reliance or address employment worries in India. A coordinated effort towards labour skill augmentation along with technology transfer will be instrumental in this regard.

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The growing literature on global value chains (GVCs) reveals that during the last two decades, the fragmentation of production processes has deepened the cross-country International Production Network (IPNs) (Coe et al 2008; Taguchi 2014). The disintegration of production blocs by global firms on the basis of regional competitiveness patterns have improved industrial capabilities in a wide range of developing countries, in turn facilitating productivity growth and innovation therein (Kummritz 2016). Baldwin and Venables (2013) defined two categories of IPNs: (i) where inputs simultaneously exported from different supplier countries are assembled in the final product in the "hub" (that is, "spiders"), and (ii) where the inputs are processed in different network partner countries sequentially (that is, "snakes"). Irrespective of the nature of IPN participation, the total exports of any country can be segregated in two sub-components: (i) the pure domestically produced and sourced components (that is, raw materials, intermediate products, embodied labour, domestic capital, infrastructure costs, and other similar resources), collectively known as the domestic value added (DVA) content in exports; and (ii) the components procured from abroad (that is, imported semi-processed products and services, energy inputs, foreign capital, royalty payments for accessing foreign technology), called the foreign value added (FVA) content.

The gradual tariff reforms and consequent rise in intermediate imports has led to higher FVA contents in India's exports (Goldar et al 2020), in turn widening the threat of premature industrialisation in the country (Chakraborty and Nagaraj 2020). The growing manufacturing trade deficit has been a major reason behind India's pull-out from the Regional Comprehensive Economic Partnership (RCEP) negotiations in 2019 (Ray Chaudhuri and Chakraborty 2021). The country subsequently launched the Atmanirbhar Bharat Abhiyan (Self-reliant India Campaign) with an objective to consolidate domestic manufacturing sectors, which may in turn lower imports of intermediate products on the one hand and improve the DVA content in exports on the other (GoI 2020). This intervention is considered crucial for the fulfilment of the Make in India (launched in 2014) objective to increase the contribution of the industrial sector in the country's gross domestic product (GDP) to 25% by 2025, particularly in light of similar schemes in competitor countries. For instance, the "Made in China 2025" scheme aspires to enhance the domestic content of components and materials in key manufacturing sectors in the dragon to "40% by 2020 and 70% by 2025" respectively (ISDP 2018).

While recent research on computation of the DVA content of India's industrial exports is on the rise, the analysis on drivers influencing the same at the sectoral level is a relatively less focused area. This paper intends to identify the factors influencing the DVA contents of India's exports in 10 key industrial sectors over 2000–18, as obtained from the Organisation for Economic Cooperation and Development (OECD) trade in value added (TiVA) database. First, a brief review of IPN–DVA literature and the Indian context is presented in this paper. The model used for the econometric analysis is subsequently discussed, followed by the empirical results. Finally, based on the findings, certain policy conclusions are drawn.

Production Fragmentation and Domestic Value Added

DVA content in gross exports of a country can be described as, "the domestic value added embodied in exports by industry *i* in country *c* covering value added generated anywhere in the domestic economy" (Mehta 2018), which can increase from multiple factors, for example, higher efficiency and innovation potential, presence of a high-skilled labour force, resource availability, regionalisation benefits from existing trade blocs, pragmatic policy framework, etc (ADB–WTO 2021; Koopman et al 2014). Given the location of domestic firms in the global production sequence, the nature of DVA embodied in the country's exports witness divergent dynamics (Rungi and Prete 2017). Additionally, international fragmentation of the industrial sector has progressed simultaneously with an intense process of "servicification" of production (De Backer et al 2015; Thangavelu et al 2018). Hence, specialisation in value-added service segments (for example, branding and marketing) in a developing country augments its importance in a global firm's value chain, giving rise to the "Smile Curve" phenomenon (Meng et al 2020).

A growing branch of the literature analyses sectoral DVA content in exports, computed from the world input output Database, TiVA data or country-based input output (I-O) tables. The presence of high DVA content in developed country exports is generally noted (ADB–WTO 2021; Johnson 2014; Vrh 2018). Among developing countries, several Asian countries have witnessed an acceleration in their economic performance through a deepened participation in GVCs and an analysis of their DVA content has emerged as an area of research (Bajaj et al 2022; Jangam and Rath 2021). The evidence in the Chinese context is particularly strong (Lu et al 2022; Sun et al 2023).

Table 1: Comparison of Domestic Value Added Content in Exports across Countries and Sectors (%)

TIVA Sectors	Developing Countries														
	China					India					Malaysia				
	1995–2000	2001–05	2006–10	2011–14	2015–18	1995–2000	2001–05	2006–10	2011–14	2015–18	1995–2000	2001–05	2006–10	2011–14	2015–18
Textile, leather and related products	81.56	81.74	86.89	88.21	88.69	94.76	90.28	84.63	82.18	83.02	49.23	54.70	58.90	62.06	65.41
Paper products, etc	81.12	79.64	82.29	84.44	86.48	89.50	84.08	77.19	73.81	78.09	54.86	55.19	57.40	62.75	66.11
Chemicals	83.87	79.84	77.81	78.97	82.60	82.73	76.26	66.37	63.67	76.63	57.75	55.54	54.26	59.10	63.69
Pharmaceuticals and medicinal chemicals	92.80	90.07	89.87	88.94	89.60	86.83	85.65	78.70	78.99	85.86	45.66	51.02	54.71	59.63	63.17
Rubber and plastics	81.00	76.73	76.33	79.95	83.00	89.39	86.81	80.81	70.17	76.71	50.84	50.91	53.12	58.67	59.48
Base metals and iron and steel	83.32	78.96	76.78	76.66	82.97	87.47	83.24	76.84	70.77	74.80	43.83	43.12	41.42	48.99	55.04
Computer and electronic products	74.17	65.02	67.51	70.26	73.34	80.98	79.49	76.03	71.64	74.85	29.99	34.17	37.86	41.70	47.29
Electrical equipment	81.21	77.42	75.89	76.93	81.15	82.91	80.32	76.30	71.92	76.17	32.74	34.09	35.15	44.36	50.49
Machinery and equipment	81.79	78.38	77.99	79.71	83.04	84.22	81.38	78.06	74.63	78.87	44.03	46.01	47.96	49.18	52.57
Transport equipment	73.62	76.59	77.79	79.21	82.75	82.44	77.19	68.72	69.93	75.99	41.82	42.13	43.57	50.24	54.73
TIVA Sectors	Developed Countries														
	Canada					EU (27)					US				
	1995–2000	2001–05	2006–10	2011–14	2015–18	1995–2000	2001–05	2006–10	2011–14	2015–18	1995–2000	2001–05	2006–10	2011–14	2015–18
Textile, leather and related products	76.87	77.03	75.32	72.57	70.10	89.90	88.85	86.75	85.50	85.74	88.90	87.03	85.32	85.02	86.91
Paper products, etc	76.51	77.24	78.00	76.93	75.34	91.29	90.27	88.38	87.27	88.30	90.58	89.60	87.97	87.25	88.84
Chemicals	69.51	68.59	67.95	69.93	70.18	87.89	85.59	82.35	78.80	81.46	89.37	86.41	83.52	84.39	87.96
Pharmaceuticals and medicinal chemicals	73.00	74.07	75.31	74.74	74.14	91.85	88.87	85.82	83.39	81.98	95.63	94.25	92.81	91.31	89.64
Rubber and plastics	68.38	68.68	68.85	69.01	68.61	89.64	88.89	86.13	84.04	85.01	89.86	88.37	85.16	84.60	87.00
Base metals and iron and steel	59.46	60.43	59.74	56.13	56.44	86.38	85.01	80.18	78.47	82.11	86.12	86.54	81.26	80.43	83.16
Computer and electronic products	62.63	64.59	69.05	67.81	67.62	82.02	79.40	76.81	77.18	78.37	85.49	85.85	87.46	91.58	93.13
Electrical equipment	63.61	62.94	61.75	62.02	60.93	89.11	87.50	85.09	83.28	83.93	86.47	86.24	83.79	82.81	85.23
Machinery and equipment	67.40	67.91	68.45	67.36	67.94	90.20	89.28	86.93	85.61	86.40	86.85	85.81	82.97	82.08	83.52
Transport equipment	58.20	59.65	56.88	54.13	51.23	87.72	86.21	83.83	82.90	82.87	82.85	81.86	80.18	78.79	80.16

Source: Authors' computation from TiVA database (OECD 2021).

Since higher DVA content in exports implies greater local value contribution and improved employment opportunities (Durongkaveroj 2022), a country may attempt to promote the same by extending policy support (Wu et al 2021). Nonetheless, Dollar et al (2019) noted that attempts to artificially enhance the DVA content through trade instruments (for example, tariffs and non-tariff measures), rather than policy reforms (improved ease of doing business, infrastructure), might adversely influence a country's GVC participation.

Given the prevalence of tariff and other policy barriers, India had a low import-intensity of exports (that is, low FVA) in the pre-1991 period (Goldar 2013). Subsequent recourse to market-conforming policies encouraged the relocation of several outward-oriented global players in India, along with a deepening participation in IPNs (Athukorala and Veeramani 2019). After India's entry into several regional trade agreements (RTAS)[1] and the launch of the "Make in India" scheme, the backward and forward linkages of local manufacturing firms has deepened in the existing IPN–GVCs (Srivastava and Sen 2015). However, several post-2010 analyses have reported a declining trend in the DVA content of Indian manufacturing exports. Working with the TiVA data, Banga (2013) noted that India's GVC participation has led to adverse value-added gains. Analysing OECD I-O tables for India over 1999–2000 to 2012–13, Veeramani and Dhir (2017) highlighted that India's deepening connection with IPN–GVCs have simultaneously witnessed a declining DVA content in gross manufacturing exports. Based on India's I-O data prepared by the Central Statistics Office (CSO), Goldar et al (2020) observed that at the sectoral levels the decline in DVA content has been accompanied by a simultaneous increase in FVA content. On the whole, India over the period has evolved as a "sub-supply hub with inflow linkage from UK [United Kingdom] and outflow linkages to Nepal and Bangladesh" (Li et al 2019). This observation raises a doubt on the quality of participation by Indian players in IPN–GVCs.

Table 1 (p 41) summarises the DVA content in the export scenario for ten Indian manufacturing segments over 1995–2018 vis-à-vis five trade partners, both from the "East" (China, Malaysia) and the "West" (Canada, European Union [EU]-27, United States [US]).[2] All the countries are generally integrated with the world through multiple RTAs and GVC–IPNs. For the purpose of this paper, ten sectors, namely, textile and leather products; paper products; chemicals; pharma and medicines; rubber and plastics; base metals; electronic products; machinery and equipment; electrical equipment and transport equipment are selected, all of which are deeply integrated with global IPNs (Ray and Miglani 2018). The average DVA contents (expressed as percentage of total exports) for different industrial product groups are reported for five periods, namely: 1995–2000, 2001–05, 2006–10, 2011–14 and 2015–18 for understanding the evolving trend. While the rising DVA content of Chinese and Malaysian sectoral exports can be viewed in the light of rising efficiencies and policy-induced catching up by domestic players (Lu et al 2022; Sahu 2016), the growing DVA content in the EU and US can be ascribed to the emergence of reshoring decisions in the recent times (Chernova 2020). A fluctuating trend in the average DVA content of exports is visible for India, with a rise in the same in the post-2014 period when the "Make in India" scheme was launched. The decline in the DVA content of sectoral exports in the pre-2014 period can to some extent be explained by the deepening of intermediate import orientation, particularly from India's RTA partners located in the East and Southeast Asia (Goldar et al 2020).

Drivers of DVA Content in Indian Exports

To distinguish the influences of the underlying factors on DVA content embodied in Indian sectoral exports, a Cobb–Douglas type production function is estimated. By the nature of GVC–IPNs, trade opportunities are created through a sequential fragmentation of production, where the location of a country in the value chain is determined by its characteristics (Rungi and Prete 2017). A higher capital-intensity in exports is likely to augment product sophistication and consequently the corresponding DVA content (Timmer et al 2014; Yu and Luo 2018). Moreover, given the potential positive influence of foreign direct investment (FDI) on the DVA content through technology transfers and augmented efficiency opportunities (Mitra et al 2020), capital is categorised into domestic and foreign subcomponents, namely, K_D and K_F.[3] Moreover, greater value-addition in a sequential GVC is expected to occur in countries enjoying a higher labour skill-intensity (Hollweg 2019). The DVA literature on India's exports displays a mixed trend so far. On the one hand, a specialising trend in capital and skill-intensive segments has been noticed (Veeramani et al 2017). On the other contrary, a negative relationship between the DVA content and export sophistication of the Indian trade basket has also been reported (Tandon 2020). Hence, the skilled (L_{SK}) and unskilled (L_{USK}) workers employed in the production process are considered separately.[4] Finally, the raw materials (M) used in production are included in the model.

Taking K_D, K_F, L_{SK}, L_{USK} and M as inputs, the production function (Y) is presented in the following form:

$$Y = AK_D^{\alpha}K_F^{\beta}L_{SK}^{\gamma}L_{USK}^{\delta}M^{\varepsilon} \quad \ldots (1)$$

where α, β, γ, δ and ε are the corresponding elasticities of factor contribution of the aggregate value-added. The logarithmic transformation of equation (1) enables us to write the expression in the following form:

$$\text{Log}Y = \text{Log}\,A + \alpha\,\text{Log}\,K_D + \beta\text{Log}\,K_F + \gamma\text{Log}\,L_{SK} + \delta\text{Log}\,L_{USK} + \varepsilon\text{Log}\,M \quad \ldots (2)$$

Equation (2) is used as the benchmark model here, where following the existing literature, India's DVA content of sectoral exports is considered as a proxy of the country's industrial manufacturing segment development and competitiveness (Koopman et al 2014; Timmer et al 2014). The model is then augmented by including other exogenous variables cited in the literature as plausible determinants of the DVA content in the exports context of developing countries (India as a case in point).

It is expected that investments (both domestic and foreign capital) can augment production sophistication and in turn facilitate greater value-addition within the country. Likewise, a

growing supply of skilled workers allows a country to undertake more sophisticated tasks on the one hand and move towards final assembly activities in the long-run on the other, facilitating a greater DVA content in exports. Therefore, a rise in domestic as well as foreign capital, skilled labour, and domestic raw materials in the production process would promote DVA content in exports. Conversely, the growing importance of unskilled employees in the workforce indicates a possible move towards low-value components of the GVC, resulting in a lesser DVA content. Therefore, the expected signs of α, β, and ε might be positive, while δ can turn out to be negative.

In equation (2), certain other independent variables with a possible impact on aggregate value-added (Y) are considered. First, participation in RTAs through mutual tariff preferences and rules of origin (ROO) harmonisation facilitates trade and specialisation in line with domestic factor endowments and efficiency levels, with possible implications on GVC participation. Since 2010–11, India has become part of a number of trade blocs involving East and Southeast Asian partners. Hence, an RTA dummy has been introduced, which takes the value of 1 from 2011 onwards and 0 in the earlier period. The dummy may have a positive coefficient, if RTAs facilitate specialisation in higher value-added segments of production (that is, rise in DVA content).

Second, for understanding the evolving supply dynamics, the number of operational firms within the selected sectors has been included in the proposed model. It is anticipated that exporting firms may witness an improved productivity through knowledge transfer from foreign collaborators and grow in size (Bayoumi et al 1999). On the contrary, an intensified competition from import liberalisation may cause the loss-making inefficient units to exit business. In the ensuing dynamics, only productive entities will continue to operate, in turn realising greater economies of scale in production and export sales (Melitz 2003). Therefore, the number of units operating is expected to be inversely related to the sectoral DVA content (Benkovskis et al 2018), due to the "learning-by-exporting" framework underlying the successful GVCs.[5]

Finally, an interaction term between foreign capital inflows in a sector and the corresponding skilled worker intensity,[6] namely, FDI*(S/U), has been included in the current model. Given the potential role of technology transfers associated with FDI inflows in the skill-intensive sectors (Aggarwal et al 2021), the coefficient is expected to be positive.

The panel data model specified in equation (3) has been estimated to analyse the influence of underlying factors on India's DVA content of sectoral exports. Logarithmic transformation of equation (1) has been used for explaining the estimated coefficients in terms of the relevant elasticities.

$$LDVA_{it} = \alpha_0 + \beta_1 L(K_D)_{it} + \beta_2 L(K_F)_{it} + \beta_3 L(L_{SK})_{it} + \beta_4 L(L_{USK})_{it} + \beta_5 L(M)_{it} + \beta_6 LFIRMS_{it} + \beta_7 L(K_F * (\frac{S}{U}))_{it} + RTA + YearD_t + SectorD_i + \varepsilon_{it} \quad \ldots (3)$$

where,

α represents the constant term

βs are coefficients

L represents logarithmic transformation of the variables

DVA_{it} represents domestic value-added content in gross exports in the i-th industry in t-th period

$(K_D)_{it}$ represents domestic capital stock used in the i-th industry in t-th period

$(K_F)_{it}$ represents foreign direct investment in the i-th industry in t-th period

$(L_{SK})_{it}$ represents the number of skilled workers employed in the i-th industry in t-th period

$(L_{USK})_{it}$ represents the number of unskilled workers employed in the i-th industry in t-th period

$(M)_{it}$ represents the materials used in the i-th industry in t-th period

$FIRMS_{it}$ represents number of firms in the i-th industry in t-th period

$(K_F*(S/U))_{it}$ represents the interaction term between FDI and ratio of skilled workers to unskilled workers in the i-th industry in t-th period

RTA represents RTA dummy variable which takes the value of 1 for 2011 onwards and 0 otherwise

$YearD_t$ represents year dummies

$SectorD_i$ represents sector dummies

ε_{it} is an error term

The empirical analysis draws India's sectoral data on DVA content in exports, trade, industrial performance and FDI from TiVA (OECD 2021), Trade Map (ITC nd), GoI (nd) and DIPP (nd), respectively. All the industry-related variables (for example, skilled and unskilled labour, capital, raw materials, number of firms) have been obtained from the Annual Survey of Industries (ASI) data (GoI nd). While the trade data reported by ITC (nd) is obtained in the Harmonised System (HS) classification, the industry-related data is reported by ASI in National Industrial Classification (NIC), which has undergone changes in 1998, 2004, and 2008, respectively. Further, the OECD TiVA sectoral classifications comprise of multiple HS chapters. The present analysis constructs a concordance between the trade codes (reported in HS) and TiVA industry codes (reported in OECD 2021 database) by matching the product descriptions. A similar concordance has been created between trade (reported in HS) and industry codes (reported in NIC) by matching corresponding product descriptions as well.[7]

Empirical Results

Initially, a couple of diagnostic tests are conducted to ensure robust estimates. For detecting the presence of unit root among the explanatory variables, the Levin–Lin–Chu test statistic in reported in Table 2. All the variables used in the regression analysis are found to be stationary. In addition, the endogeneity check for the included variables has been performed using a two-stage least squares (2SLS) method. It is observed that the Wald

Table 2: Levin–Lin–Chu Panel Unit Root Test Statistic

Variables	t-Statistic	P-value
$L(K_D)$	-3.4351	0.0003 ***
$L(K_F)$	-2.1649	0.0152 **
$L(L_{SK})$	-1.5746	0.0542 **
$L(L_{USK})$	-1.9637	0.0248 **
L(M)	-3.6356	0.0001 ***
LFIRMS	-1.6378	0.0425 **
L(FDI*(S/U))	-2.1278	0.0167 **

*** and ** denote the statistical significance at 0.01 and 0.05 respectively.
Source: Authors' estimation.

chi-square test statistic of 62.98 (Prob 0.00) is statistically significant. The Durbin score of 0.1472 (Prob 0.706) and Wu–Hausman statistic of 0.1256 (Prob 0.729) are not significant, so the null hypothesis of exogeneity in the model is not rejected. Therefore, it can be noted that explanatory variables used in the panel data analysis such as unskilled workers, skilled workers, domestic capital, foreign capital, and materials are not endogenous. The summary statistics for the variables in the empirical model is noted in Table 3. The Chi-square test statistic for the Hausman test is 5.12 (Prob 0.7685), which is statistically non-significant, indicating the presence of an underlying random effect model. The Chi-square value (χ^2 = 3.28, Prob > χ^2 = 0.0718) of the Breusch–Pagan/Cook–Weisberg test indicates that no heteroskedasticity is present. The estimated mean variance inflation factor (VIF) is 3.16, which lies within the tolerance limit of multicollinearity. Based on the diagnostic tests, this paper estimates a generalised least squares model in the panel data framework. The regression results are summarised in Table 4.

Several interesting thoughts emerge from the empirical results. First, a rise in domestic capital-intensity as well as FDI positively and significantly influences the DVA content in exports. The result implies that rising capital intensity exerts a positive effect on sectoral competitiveness and DVA content through technology and knowledge infusion for concerned units on the one hand and an indirect spill-over benefits for local intermediate supplier network entities on the other.

Second, while the sectoral DVA contents are positively influenced by the presence of skilled workers, unskilled labour impacts the same negatively. Growing capital and technology-intensity in a sector may create a rising demand for skilled workers, ultimately leading to the deepening of value-added activities therein, reflected in a higher DVA content in exports. Conversely, a demand for unskilled labour is expected to go down in sectors witnessing a higher DVA content, where technology-intensity would limit the scope of employing such workers. Third, the growing use of domestic raw materials would understandably enhance the DVA content in exports.

Fourth, the coefficient of the RTA dummy is positive and significant, indicating a favourable influence of operational trade agreements since 2011 in influencing the DVA content in India's exports. While the RTAs with the East and Southeast Asian countries have increased the import-content during 2006–14 (Bhattacharyya and Mandal 2014), the DVA content in the selected sectors have increased, particularly after 2014 (Chakraborty et al 2019).

Fifth, along expected lines, the coefficient for operational units at the sectoral level is negative and significant, which underlines an interesting dynamic within Indian manufacturing segments as a consequence of rising imports. While growing trade opportunities enable more productive units to expand and enjoy economies of scale, the inefficient firms will be forced to close down. The resulting dynamics may lower the number of operational units within a sector, but the more productive units will continue to contribute in the rising DVA content of the country's exports.

Finally, the relationship between the interaction term (*FDI*(S/U)*) and the DVA content is found to be positive along expected lines, implying that higher FDI inflows in greater labour-skill intensive sectors (signifying the potential to move towards production sophistication and specialisation in final assembling activities) enhances the corresponding DVA content of exports.

Table 3: Summary Statistics

Variable	Observation	Mean	Std Dev	Min	Max
$L(K_D)$	190	11.33739	.482346	10.2654	12.36699
$L(K_F)$	190	9.74979	.7929617	8.018912	11.42479
$L(L_{SK})$	190	5.035067	.3750433	4.340682	5.774339
$L(L_{USK})$	190	5.479514	.4677701	4.631129	6.420099
L(M)	190	11.91725	.5049039	10.78962	13.02624
LFIRMS	190	3.818699	.4093462	2.910625	4.561161
L(FDI*(S/U))	190	9.305343	.7718507	7.687175	11.11751

Source: Authors' estimation.

Table 4: Regression Results on Determinants of DVA Content of Indian Sectoral Exports

Independent Variables	Dependent Variable: LDVA						
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
Constant	2.534***	2.441***	2.403***	2.430***	2.446***	2.471***	2.474***
	(0.096)	(0.080)	(0.099)	(0.099)	(0.108)	(0.104)	(0.099)
$L(K_D)$	0.096***	0.049***	0.044***	0.056***	0.059***	0.135***	0.132***
	(0.012)	(0.011)	(0.012)	(0.014)	(0.016)	(0.051)	(0.036)
$L(K_F)$		0.038***	0.038***	0.035***	0.035***	0.020***	
		(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	
$L(L_{SK})$				0.019**	0.026**	0.023*	
					(0.011)	(0.024)	(0.026)
$L(L_{USK})$					-0.006*	-0.026*	
					(0.018)	(0.019)	
L(M)						0.191***	0.188***
						(0.048)	(0.038)
LFIRMS	- 0.115***	-0.097***	- 0.094***	-0.090***	-0.093***	-0.085***	-0.087***
	(0.013)	(0.011)	(0.012)	(0.012)	(0.015)	(0.014)	(0.012)
L(FDI*(S/U))							0.021***
							(0.005)
RTA			0.004*	0.001*	0.001*	0.001*	0.005*
			(0.007)	(0.007)	(0.007)	(0.007)	(0.006)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	190	190	190	190	190	190	190
R-squared	0.824	0.917	0.921	0.928	0.929	0.946	0.754
F-statistics	91.27	219.49	220.40	226.48	226.76	261.49	151.08

Figure in the parenthesis shows the standard errors of the estimated coefficient.
***, **, and * implies estimated coefficient is significant at 0.01, 0.05, and 0.10 level, respectively.
Source: Authors' estimation.

Conclusions

Following the trade and industrial policy reforms from 1991 onwards, India's participation in GVC–IPNs have deepened considerably. It is observed from the TiVA data that India's DVA content in aggregate manufacturing exports has gradually declined from 90.29% in 1995 to 74.07% in 2012,

owing to rising imports of parts and components and intermediate products, resulting from the unilateral as well as RTA-led tariff reforms. While the rising connection with the GVC–IPNs linked Indian manufacturing segments with "Factory Asia," the widening trade deficit related concerns simultaneously emerged (Khati and Kim 2023), adversely affecting India's RCEP participation decision. The introduction of several policies since 2010, for example, the issuance of "guidelines enabling manufacturing sector to be competitive" through quality management (launched as part of the National Manufacturing Competitiveness Programme in 2010), "National Manufacturing Policy" (initiated in 2011), "Science, Technology and Innovation Policy" (2013), "Act East Policy," "Make in India" (2014), "Skill India Mission" (2015), "Foreign Trade Policy" (since 2015), FDI-related reforms (since 2015), ongoing improvements in "ease of doing business" (since 2015), launch of phased manufacturing programmes, etc, significantly enabled the country to progress along the quality ladder within the GVCs. These systemic reforms, along with sector-specific initiatives, for example, the "National Auto Policy" (launched in 2018), the "National Policy on Electronics" (2019), "India Semiconductor Mission" (2022), etc, helped the country's DVA content in aggregate manufacturing exports to increase up to 80.15% in 2018. Along the evolving orientation during the last decade, the Atmanirbhar Bharat Abhiyan launched in May 2020 can be considered as a deliberate decision to reduce India's import dependence, while facilitating exports of final value-added products. The empirical findings of this paper, focusing on the determinants of India's DVA content in manufacturing exports, need to be considered in this broader canvas.

Recommendations

The policy recommendations emerging from the model results are noted here. First, while the injection of domestic capital can enhance manufacturing production along the frontier, advanced technology associated with foreign capital inflow can enhance efficiency and shift the production function itself. The positive impact of both domestic capital and FDI flows on the sectoral DVA content of exports underlines the role of technological upgradation in the Indian context. Once a country starts progressing on production sophistication (reflected in growing capital-intensity of the export basket), prominent multinational corporations (MNCs) will gradually start integrating firms located therein in their GVC through setting up of production units on the one hand and encouraging their supplier network partners to relocate there on the other. The exports of sophisticated components/final assembled products through the established distribution channels of the global MNCs on the one hand and the decline in import requirements on the other is expected to collectively enhance the DVA content in the country's exports. Now, given the rising DVA content in the country during 2015–18 across sectors (Table 1) in a period characterised by FDI reforms, the need for enhancing the technology-orientation in Indian manufacturing segments is stressed in no uncertain terms. The removal of institutional and infrastructural bottlenecks can enhance the in-house research and development (R&D) activities (Nath et al 2021) and secure transfer, rather than "transport," of technology in the country (Verma 2018), respectively. As the FDI inflows facilitate the DVA content of exports, there is a need for the policymakers to identify the sector-specific advantages that may entice leading foreign firms to relocate in India and appropriately address this aspect in the upcoming foreign trade policy.

Second, in India, more than 60% of the population is engaged in the primary sector, which contributed 18.8% of gross value added (GVA) in 2021–22 (GoI 2022a). Moreover, Indian micro, small and medium enterprises (MSMEs) employ around 40% of the total workforce (Saini 2014), and contributes 36.9% and 49.5% of the country's manufacturing gross output in 2020 and total exports in 2021 respectively (IBEF 2022). While the unemployment scenario in India has improved (GoI 2022b), a sustained growth of the manufacturing exports, including from the MSME units, is crucial for engaging the expanding workforce in the country. In this context, the negative coefficient of the number of firms in estimated models signify that the DVA content in exports is primarily being driven by larger units. This implies that the recent focus on encouraging global players to relocate/upscale production units in India (for example, Foxconn) for enhancing the DVA content of exports may not be sufficient for including the vast majority of unskilled/low-skilled workers trapped in the primary sector, and unorganised and MSME industries in the growth drive. In order to absorb the vast number of unskilled/low-skilled workers in the industrial revival narrative, special focus needs to be provided for training and re-skilling them through the "Skill India" mission (*EPW* 2020).

Finally, the interaction term involving FDI and skill-intensity indicates that there is a need for identifying key sectors capable of attracting technology transfers from abroad for strategic support. As observed from the recent solar panel dispute involving the US at the World Trade Organization (WTO), the provision of either firm-specific transfers or setting explicit domestic content requirements may not be WTO-compatible instruments. Instead, the creation of sector-specific clusters with deeply integrated supplier networks and the introduction of trade facilitation reforms for securing hassle-free operations for exporter units can enhance the DVA content in exports. Government initiatives to promote sector-specific clusters (for example, electronics and semiconductor segment) and launching of the Prime Minister Gati Shakti or the National Master Plan for Multi-modal Connectivity in 2021 are among the interventions in this direction.

In 2019, India opted out from the RCEP negotiations owing to the widening trade deficit related challenges and refrained from entering into new RTAs for the next two years. In 2022, however, the country entered into RTAs with the United Arab Emirates and Australia, and looking forward to concluding trade deals with Canada, the EU and the UK in the coming future. For enjoying trade surplus with the new RTA partners, the DVA content embodied in exports in bilateral trade flows would play a crucial role. The present analysis indicates that domestic value addition in exports is being done primarily by

the relatively larger capital-intensive firms characterised by an increasing return to scale, majorly employing skilled labour. Thus, laying a disproportionate focus on an export-led growth strategy may bypass a major section of unskilled workers in the country. The observation also can be interpreted as a warning against relying excessively on a short-run export-led growth strategy for India's development purposes through pure capital market interventions (for example, the lowering of interest rates) and FDI reform policies, which may intensify inequality in general and unemployment among unskilled workers in particular. In effect, unless due policy recognition of these concerns takes place, the anticipated DVA content-related benefits from India's Atmanirbhar Bharat Abhiyan, in an era of deepening RTA participations, may remain under-fulfilled.

NOTES

1 In particular, India–ASEAN FTA (2010), India–South Korea Comprehensive Economic Partnership Agreement (CEPA) (2010), India–Japan CEPA (2011) and India–Malaysia Comprehensive Economic Cooperation Agreement (CECA) (2011) deserve mention.

2 For understanding the sectoral DVA content of India's industrial exports, the data for current analysis is obtained from the OECD–TiVA database, which provides a statistical estimate of value created by origin (country sector) in a country's exports. Various versions of the TiVA database are available from OECD resources. This paper has obtained data for the selected sectors during 2000–18 from TiVA (2021) database (OECD 2021). The DVA content for all sectors is not available beyond 2018 from TiVA database.

3 K_D is measured by physical working capital data obtained from ASI data at the corresponding NIC 4-digit levels (GoI nd). Sector-wise approved FDI inflows data obtained from SIA Statistics (DIPP nd) has been considered as K_F.

4 The number of skilled and unskilled (including low-skilled and semi-skilled) workers data has been taken from ASI (GoI nd) at corresponding NIC 4-digit levels.

5 The number of factories data obtained from ASI (GoI nd) at corresponding NIC 4-digit levels has been used in the model as proxy of the number of firms.

6 The (S/U) ratio is computed by dividing the number of skilled workers by unskilled workers, as obtained from ASI, at corresponding NIC 4-digit levels.

7 For the purpose of this analysis, the trade classifications reported in OECD TiVA database are matched with the corresponding trade data reported in HS at HS 4-digit level (ITC nd). The DVA content data from OECD is obtained accordingly. The Indian trade data is then matched with the industry data reported in National Industrial Classification (NIC) at 4-digit levels. These two concordances developed by authors are then used to construct the dataset for the current analysis.

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