Does Participating in Mining Global Value Chains Lead to Lower Industrialization?

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Abstract

This study investigates whether participating in forward global value chains in mining industries leads to a decline in manufacturing industry by using EXIOBASE-3 database. Our empirical results indicate a positive relationship between forward Global Value Chain (GVC) participation in coal and crude petroleum and the growth of value-added in the manufacturing industry. In contrast, participation in GVCs for non-ferrous metal ores, iron ores, and stone, sand, and clay are found to have a significant negative effect on the growth of manufacturing value-added. Overall, our findings indicate that participation in mining forward GVCs presents more risks to the manufacturing industry compared to involvement in fossil fuels.

1 Introduction

Global value chains (GVCs), which distribute various segments of production across different countries, offer a perspective to understand trade dynamics along with the benefits and challenges of increased global interconnectedness (see, Rodrik, 2018). While extensive analyses have repeatedly scrutinized downstream value chains, such as those of mobile phones, semiconductors, and motor vehicles, mining industries have largely been overlooked. Yet, for numerous countries, mining industries remain critically significant (see, Korinek, 2020). This paper endeavors to address this oversight by providing an empirical examination of mining industries' role within manufacturing growth.

To do so, firstly, we utilize EXIOBASE-3 dataset for 49 countries over the period 1995–2022. Then, we distinguish the effects of mining sub-industries' forward participation which are coal, crude petroleum, natural gas, non-ferrous metals, iron ores and stone sand and clay on manufacturing value-added growth. Our approach is motivated by the fact that participation in mining GVCs would decisively matter for economic outcomes. To investigate the effects of fuel sub-industries would decisively matter for manufacturing growth because the advancements and productivity improvements within these mining sub-industries can lead to increased efficiency, innovation, and value addition in the manufacturing industry (see, Katz and Pietrobelli, 2018; Lebdioui, 2022). On the other hand, excessive integration into forward participation for mining industries might lead to a decline in manufacturing industry growth as Dutch Disease or resource curse literature indicate (see, Butkiewicz and Yanikkaya, 2010; Sachs and Warner, 2001). Therefore, we also aim to test whether participating in mining GVCs leads to a decline in manufacturing value added growth.

Our results indicate that forward participation in GVCs for coal and crude oil enhances value-added growth in the manufacturing sector within our sample. Conversely, forward GVC participation in the mineral industry, specifically in non-ferrous metals, iron ores, and stone, impedes the growth of the manufacturing industry. Our results might suggest that Dutch Disease effects in manufacturing are evident as countries are more entrenched into mineral forward GVCs. On the other hand, engaging into GVC participation in fossil fuels might yield some benefits to manufacturing industry through productivity improvements, efficiency, and the development of upstream to downstream linkages.

This paper is constructed as follows: next section explains the model and the data, third section presents and discusses the empirical results, and the final section concludes and presents several policy implications.

2 Model and Data

We specify our empirical model with forward global value chain participation indices as in Yanikkaya et al., (2022):

$$Y_{i,c,t} = \beta 2 K/L_{i,c,t} + \beta 3 \text{ Forward Participation }_{i,c,t} + v_t + v_c + v_i + \varepsilon_{i,c,t} \quad (1)$$

where Yi,c,t and K/Li,c,t represent value added growth per worker and fixed capital stock per worker for manufacturing, compiled from the EXIOBASE-3 satellite accounts. v_t , v_c , v_i and $\varepsilon_{i,c,t}$ act as the time, country, industry dummies and the error term in equation (1), respectively.

We construct the forward GVC participation ratios from EXIOBASE-3 MRIO tables which consists of 49 countries and 6 fuel and 23 manufacturing industries between 1995 – 2022. We utilize this database over EORA and WIOD because it offers a high level of detail in terms of sectors and products. It disaggregates the countries into many different industries and products, which can be crucial for detailed GVC studies (see, Stadler et al., 2018). Next, we follow Koopman et al. (2014) to measure the extent of forward GVC participation. Forward

participation is determined by the ratio of domestic value added reflected in the gross exports. In this measure, a larger ratio indicates a higher level of industry participation in forward GVCs. The summary statistics are presented in Table 1.

All our empirical specifications are estimated through the two-way fixed effects method to control individual heterogeneity and capture the time effects. In the context of GVCs, unobserved factors such as country-specific institutional quality, cultural aspects, or technological capabilities might influence both the participation in GVCs and value-added growth. By controlling for these unobserved characteristics that do not change over time, the fixed effects method allows for a more accurate estimation of the relationship between GVC participation and value-added growth. Also, fixed effects models can also account for time-specific effects that impact all countries or industries in a similar manner.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Value Added per Worker Growth	25629	4.158	21.12	-57.475	68.251
Manufacturing Forward Participation	27267	37.502	19.423	0.066	93.772
Manufacturing Capital per Worker in Logs	26488	1.385	1.627	-3.519	5.254
Coal Forward Participation	22460	64.885	19.179	0.003	96.348
Petroleum Forward Participation	21200	71.485	22.607	0.87	99.472
Natural Gas Forward Participation	22100	45.349	28.559	0.004	98.699
Non-Ferrous Metals Forward Participation	20100	59.842	27.8	0.001	98.47
Iron Ores Forward Participation	22340	69.000	21.704	0.775	96.04
Stone, Sand and Clay Forward Participation	27440	76.778	11.496	28.255	97.664

Table 1. *Summary Statistics*

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Capital per Worker in Logs	1.468***	1.452***	1.549***	1.474***	1.468***	1.583***
	(0.134)	(0.150)	(0.142)	(0.142)	(0.134)	(0.128)
Manufacturing Forward Participation	0.091***	0.088***	0.092***	0.083***	0.083***	0.108***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)
Coal Forward Participation	0.021*					
	(0.012)					
Crude Petroleum Forward Participation		0.033***				
		(0.011)				
Natural Gas Forward Participation			0.004			
			(0.007)			
Non-Ferrous Metals Forward Participation				-0.025*		
				(0.015)		
Iron Ores Forward Participation					-0.029**	
					(0.012)	
Stone, Sand and Clay Forward Participation						-0.155***
						(0.021)
Observations	20,467	19,394	20,138	18,412	20,383	25,064
R-squared	0.075	0.078	0.068	0.081	0.070	0.064

Notes: Time, industry, and country dummies are included in all specifications, but not reported. All forward GVCs enter as lagged into the specifications. Clustered robust standard errors are in paratheses.

Table 2. *Mining Forward GVCs and Manufacturing Value-Added Growth*

3 Empirical Results

Table 2 shows our fixed effects estimations for the impact of forward GVC participation on manufacturing value-added growth. Columns (1) and (2) of Table 2 reveal a positive relationship between forward participation in coal and crude oil exports and the growth rate of the manufacturing sector. Engaging in the forward GVCs for coal and crude oil can generate export earnings, which may then be invested in importing machinery, raw materials, and advanced technologies essential for the development of manufacturing industries. This infusion of capital and technology has the potential to enhance the productivity and efficiency of the manufacturing sectors, thereby contributing to increased value-added growth rates (see Auty, 1990). Also, forward participation in coal and crude oil exports can lead to the development of upstream (e.g. mining and drilling) and downstream (e.g. petrochemicals, coke, and oven products) manufacturing industries. These linkages can stimulate value-added growth from various segments of manufacturing industries, as they create new lucrative opportunities for local companies to integrate into GVCs through resource-intensive industries.

The findings presented in columns (4), (5), and (6) reveal that forward GVC participations in non-ferrous metals, iron ores, and stone, sand, and clay are associated with a crowding-out effect on the growth rate of manufacturing value-added. This phenomenon may align with the resource allocation shifts described in the Dutch Disease framework. Due to their higher returns, these resource-intensive industries are likely to draw both domestic and foreign investment away from the manufacturing industry. Consequently, this reallocation of resources could significantly deplete the inputs available to manufacturing, thereby impeding its value-added growth (see Corden and Neary, 1982). Another plausible explanation is that as resource intensive industries can experience higher price volatility and higher returns for the investors in commodity markets thereby making resource-intensive industries more attractive than traditional manufacturing industries. Speculative investments in resource intensive industries can divert financial capital from manufacturing industries and diminish its value-added growth rate (see, Botta, 2017).

4 Conclusion

This study examines the effects of forward GVC participation in mining on manufacturing value-added growth by using the data for a large sample of industries and countries in EXIOBASE-3 database. Our fixed effects result strongly suggests that there is a positive relationship between forward GVC participation in coal and crude petroleum and value-added growth in manufacturing industry. Conversely, there is a significant negative impact of forward GVC participation in non-ferrous metal ores, iron ores, and stone sand and clay on manufacturing value-added growth. The positive relationship between forward participation in coal and crude oil exports and manufacturing sector growth can be attributed to direct economic benefits such as upstream and downstream linkages and higher export earnings, while the crowding-out effect on manufacturing value-added growth due to the connecting forward GVC integration in industries like non-ferrous metals, iron ores and stone, sand and clay could be attributed to resource shift effects of Dutch Disease. All in all, our findings suggest that participation in mineral forward GVCs poses greater risks to the manufacturing sector than involvement in fossil fuels.

Based on our empirical results, a range of policy recommendations become evident. To counteract an excessive dependence on resource-intensive sectors like minerals, countries should promote economic diversification to bolster the growth of manufacturing industries that have substantial domestic connections. This involves formulating policies aimed at enhancing the connections between mineral industries and manufacturing. Such policies should support industries that process raw minerals within the country rather than exporting them, thereby increasing the added value domestically. Also, to mitigate Dutch Disease effects, countries could aim to stabilize the exchange rate and prevent excessive appreciation that would harm the competitiveness of the manufacturing sector. This might involve using stabilization funds or adopting sound monetary policies that temper the impact of large inflows of foreign funds. To counter the speculative investment in resource intensive industries, countries could implement regulatory measures to monitor and control excessive returns and price surges. By doing so, countries could stabilize investment flows in resource intensive industries, thereby safeguarding the value-added growth of manufacturing.

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