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Does participation in agricultural GVCs impede manufacturing growth?

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Abstract: This study investigates whether participation in agricultural global value chains (GVCs) leads to slower growth in manufacturing for the period of 1995–2022 in 44 countries. Our baseline estimations indicate that forward GVC integration in agriculture, crop cultivation and animal production supports manufacturing growth. We further explore whether the income level of countries influences the impact of agricultural GVCs on manufacturing growth. Forward participation in agriculture, crop cultivation, and animal production in developing countries increases growth. However, in developed countries, deeper forward integration in animal production and backward integration in crop cultivation have a substantial negative impact on manufacturing growth. Furthermore, we test if resource reliance in manufacturing matters. Our findings reveal that forward participation in agriculture, crop cultivation, and animal production stimulates growth in resource-based manufacturing. For non-resource-based manufacturing, higher integration into backward participation in animal production drives growth. Overall, our results indicate that exporting agricultural intermediaries might not necessarily be a resource curse, instead, they can serve as a catalyst for industrialisation in developing countries.

Keywords: agriculture; global value chains; manufacturing; value added growth

Advancements in communication and transportation technologies have made it possible to distribute different stages of production across borders, which leads to a significant transformation in manufacturing processes (Amador and Cabral 2016). While global value chain (GVC) integration offers well-documented advantages such as higher specialisation, access to cheaper inputs, scale economies, and technology spillovers (Criscuolo and Timmis 2017; Constantinescu et al. 2019) it also entails notable drawbacks. Countries may face some risks such as job displacement and other structural challenges (Rodrik 2018). Therefore, it is crucial to explore their specific impact on manufacturing growth particularly in the context of agriculture sectors which has received very limited attention in the literature. Given the increasing nature of interdependency among industries and countries, agriculture GVCs could act as catalysts for manufacturing growth through intermediate inputs and technology transfer, generating spillover effects. By participating in agriculture GVCs, firms would increase their income through exports, which in turn promotes the domestic demand for manufacturing goods. Furthermore, the importance of an increase in agricultural productivity through GVCs cannot be overemphasised for structural transformation in manufacturing (Johnston and Mellor 1961).

On the other hand, another strand in the literature suggests that agricultural GVC integration could lead

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to a reduction in manufacturing (Lim 2021). In the case of natural resource dependency, agricultural GVC integration may result in resource curse or the Dutch disease effects on manufacturing industry. Therefore, empirical studies on the nexus between agricultural GVCs and manufacturing growth are worthwhile and needed to identify, design and implement trade policies as the literature on this nexus is somewhat scant.

Our study aims to investigate the role of agricultural GVCs in manufacturing growth and contributes to the existing literature with novel features in several ways. First, to the best of our knowledge, unlike previous studies such as Montalbano and Nenci (2022) and Lim (2021) our study breaks down agricultural GVCs into two main sub-industries, namely crop and animal production, and analyses their separate effects on manufacturing growth. The reason why we investigate both crop and animal production chains separately are due to the differences in input–output linkages and their proximity to the final demand. Second, we also consider whether the nexus between agricultural GVCs and manufacturing growth differs by the resource reliance of manufacturing sectors and the income level of countries. Third, since some studies (Montalbano and Nenci 2021) indicate the importance of making a distinction between GVC participation indices, we thus investigate the impact of both backward (measured as foreign value added in exports) and forward (measured as domestic value added that ends up in the exports of third countries) agricultural GVC participation on sectoral value added growth rates in manufacturing. Finally, Lim (2021) includes both primary and secondary industries such as food processing in the description of agricultural GVCs, we focus solely on primary industries for constructing agricultural GVCs. We think that our measure of agriculture GVCs is a more appropriate to gauge the impact of primary resources on manufacturing growth.

Our estimates reveal that forward GVC integration in agriculture, crop cultivation and animal production support manufacturing growth. Additionally, we infer that whether the development level plays a crucial role in how agricultural GVCs affect manufacturing growth. In developing countries, forward participation in total agriculture, crop cultivation, and animal production shows similar effects to those obtained for the full sample. However, in developed countries, higher integration into forward participation in animal production and backward participation in crop cultivation negatively and significantly impacts manufacturing growth. Lastly, we test whether resource reliance matters in manufacturing for the effect of agricultural GVCs. We find that forward participation in agriculture, crop cultivation and animal production boosts resource-based manufacturing growth. As for non-resource-based manufacturing, higher integration in backward participation in animal production boosts growth.

Literature review. GVCs have roots in various theoretical concepts, such as production fragmentation, trade in intermediate goods, unbundling, and trade in tasks (Grossman and Helpman 1993; Deardorff 2001). Advancements in technology have made it easier to participate in GVCs, leading to a rise in the proportion of intermediate inputs, parts, and components in global trade. Different countries or firms separate and distribute production phases or tasks considering cost and productivity differences. Various studies have identified multiple ways in which GVCs can bring about substantial advantages (Constantinescu et al. 2019; Pahl and Timmer 2020). For example, Criscuolo and Timmis (2017) identify multiple pathways for enhancing productivity within GVCs, including specialisation, input trading, and knowledge transfer.

However, it would be misleading to assert that GVC participation will automatically and unequivocally generate positive effects regardless of other factors such as absorptive capacity or hierarchical relations in the GVCs. Broadly speaking, some studies cast doubt on the positive effects of GVC participation and find some mixed results considering different factors. Baglioni and Campling (2017) argue that global commodity chains are characterised by several power asymmetries, including unequal bargaining power between firms, weak regulatory frameworks, and limited opportunities for local firms to capture economic value from GVCs. Rodrik (2018) discusses the challenges and limitations of GVC participation in developing economies, emphasising that while GVCs can channel exports and introduce new technologies, they often benefit only a small fraction of globally integrated firms.

As discussed above, while joining agricultural GVCs may enable an agriculture sector to benefit from deeper integration, it may also yield economic gains in terms of manufacturing sector performance. Firstly, participation in forward GVC linkages in agriculture industries could raise export revenues, which can subsequently be used for complementary investments for industrialisation (Roemer 1979). Secondly, agricultural GVCs can facilitate manufacturing growth through the provision of intermediate inputs. The intermediate inputs from global markets

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for manufacturing industry may boost productivity by facilitating technology transfer, which further increases the competitiveness of manufacturing and its growth. Hence, the enhancement of agricultural productivity through GVCs is also crucial for structural transformation and value addition in manufacturing industries. Third, participation in agriculture GVCs enables suppliers to boost their incomes through backward and forward linkages. The higher income among producers of agricultural products translates into higher demand for the goods produced by manufacturing industry (Johnston and Mellor 1961). Fourth, the agricultural sectors often serve as conduits for high-tech intermediate goods via both backward and forward GVC participation. These intermediates act as vehicles for advanced knowledge, which enhances manufacturing productivity (Halpern et al. 2015). Forward GVC participation in agriculture fosters manufacturing development via a 'demand-pull' mechanism. As countries expand high-quality agricultural exports, domestic firms are pressured to upgrade sanitary controls, adopt automation in processing, and establish modern cold-chain logistics. These adaptations stimulate the expansion and technological upgrading of manufacturing industries (Wang et al. 2022). Additionally, growth in agricultural exports through GVCs could trigger broader input-output spillovers by elevating demand for capital-intensive manufacturing inputs (Bahar et al. 2019). Fifth, deeper integration into agricultural GVCs can generate alternative 'short-cut' pathways for structural transformation (Lim 2021).

On the other hand, several transmission mechanisms would clarify why agriculture GVC participation may crowd out the manufacturing industry. One possible undesirable side effect of agriculture GVC participation concerns with specialisation patterns which is linked to the Dutch disease framework (Matsuyama 1992; Sachs and Warner 2001). A comparative advantage in agricultural production due to the abundancy of primary resources generally constrains an expansion of tradable industries such as manufacturing. Similarly, due to the inelastic nature of world demand for agricultural products given to the world income, export revenue and the gains reaped from agriculture GVCs can be highly volatile and uncertain, potentially leading to economic instability and crowding out of manufacturing industries (Singer 1975). Additionally, as agriculture industries become more integrated into GVCs, labour and capital shifts to the upstream industries which can result in a shortage of skilled labour in downstream industries (Jenkins and Edwards 2015). Finally, when imported inputs by the agriculture sector acts as substitutes rather than complements for manufacturing production, industries might suffer due to reduced demand for local procurement, leading job losses or even local industries to decline. A recent study by Lim (2021) reports that engagement in agricultural GVCs leads to a decline in manufacturing shares.

In summary, there is a significant link between manufacturing growth and agricultural GVCs. Theoretically, this relationship can be negative, positive, or insignificant, depending on the transmission mechanisms and the specific country or sector conditions discussed above. In other words, GVC participation does not guarantee or dictate a specific outcome; instead, it suggests various possibilities. Somewhat conflicting results reported in the literature are not surprising given the differences in the data and estimation methods, strongly pointing out the need for more empirical studies.

MATERIAL AND METHODS

We can specify our empirical models with agricultural GVC participations as expressed in Equation (1).

The control variables include capital stock per worker, secondary school enrolment rates, the polity index, and manufacturing GVC participation. More specifically, capital stock per worker serves as a proxy for the intensity of physical capital to manufacturing industries. Gross secondary school enrolment rates serve as a parsimonious indicator of human capital accumulation. The polity index is included as a proxy for institutional quality, which is a well-known driver of economic performance. Lastly, manufacturing GVC

$$\begin{aligned} Y_{c,t} = a + \beta_1 \textit{Agricultural Backward GVC Participations}_{x,m,t} + \\ + \beta_2 \textit{Agricultural Forward GVC Participations}_{x,m,t} + \gamma \textit{Controls}_{c,t} + v_t + z_{x,m} + \varepsilon_{c,t} \end{aligned} \quad (1)$$

where: $Y_{c,t}$ – the value added growth rate for manufacturing, resource-based manufacturing and non-resource-based manufacturing; v_t, $z_{x,m}$, $\boldsymbol{\varepsilon}_{c,t}$ – the time dummies, country dummies (for both exporter and importer countries) and the error term, respectively.

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participation captures the degree to which a country's own manufacturing sector integration, and it serves as a proxy for trade openness in our model. Data on capital, value added, and employment are sourced from EXIOBASE-3 MRIOs (multi-regional input–output), while secondary school enrolment rates (gross %) are obtained from the World Development Indicators. The polity index (–10 to +10) is drawn from the Polity IV project. Additionally, agricultural GVC participation is disaggregated into two sectors namely crop cultivation and animal production.

Using Koopman et al. (2014) approach, we derive GVC participation indices from the EXIOBASE-3 MRIOs for 44 countries from 1995 to 2022. EXIOBASE-3 is an environmentally extended multi-regional input–output database developed by a European research consortium. A list of countries is provided in Table S1 (Electronic Supplementary Material – ESM). It closely matches aggregate patterns in OECD-ICIO and EORA while providing finer sectoral detail (Stadler et al. 2018).

Specifically, forward participation is determined by the ratio of domestic value added reflected in exports from third countries, while backward participation is the foreign value added of gross exports. Notably, our measure of forward linkage corresponds to the 'complex' type of GVC participation – intermediate exports that cross more than one border – which is particularly sensitive to global GDP fluctuations. Such complex forward participation is also well suited to capturing the shocks and trends transmitted from agricultural GVCs to manufacturing growth (Koopman et al. 2014). For these GVC measures, a larger ratio indicates higher industry participation in global production networks. Table 1 presents the mean values of our 5-year averaged sample.

All our empirical specifications are estimated using an instrumental variable-two-stage least squares (IV-2SLS) approach to address potential endogeneity between agricultural GVC participation and manufacturing value added growth. Endogeneity may arise due to the reverse causality, the omitted variable bias, or the measurement error in GVC participation. Therefore, an OLS estimation would therefore present the risks of biasing the coefficients on agricultural GVCs. To overcome this, agricultural GVC participation is instrumented with distance-weighted agricultural GVCs, following Owusu (2025). This instrument presents the idea that countries are more likely to participate in GVCs if they are geographically proximate to major exporters and importers of agricultural intermediates. It thus would capture exogenous variation in agricultural GVC integration that is partially unrelated to domestic manufacturing conditions.

Table 1. Summary statistics

Variables	Manufacturing						Resource based manufacturing		Non-resource based manufacturing	
	Full sample		Developing countries		Developed countries					
	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.	Mean
VA growth	9 246	4.280	4 834	5.749	4 412	2.671	9 246	4.089	9 246	4.561
log *(K/L)*	9 246	1.728	4 834	1.029	4 412	2.494	9 246	1.819	9 246	1.547
GVC	9 246	17.915	4 834	18.534	4 412	17.237	9 246	20.931	9 246	14.822
Polity	9 246	8.770	4 834	7.737	4 412	9.902	9 246	8.770	9 246	8.770
Secondary school enrolment	9 246	102.263	4 834	93.002	4 412	112.409	9 246	102.263	9 246	102.263
Agriculture BP	9 246	4.725	4 834	4.356	4 412	5.129	9 246	4.725	9 246	4.725
Agriculture FP	9 246	7.540	4 834	8.154	4 412	6.867	9 246	7.540	9 246	7.540
Crop BP	9 239	4.824	4 829	4.181	4 410	5.528	9 239	4.824	9 239	4.824
Crop FP	9 239	6.341	4 829	6.946	4 410	5.679	9 239	6.341	9 239	6.341
Animal BP	9 006	4.526	4 642	3.62	4 364	5.490	9 006	4.526	9 006	4.526
Animal FP	9 006	7.371	4 642	7.993	4 364	6.710	9 006	7.371	9 006	7.371

VA – value-added; *GVC* – global value chain; *K/L* – capital intensity; *BP* – backward participation; *FP* – forward participation; Obs. – observations

Source: Authors' own elaboration

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RESULTS AND DISCUSSION

Table 2 shows our IV-2SLS estimates for the impact of agriculture industry GVC participation on manufacturing value added growth. For the full sample, the first three columns of Table 2 indicate that there is a negative relationship between capital stock per worker and manufacturing value added growth, indicating the diminishing returns of capital. Regarding the control variables, manufacturing GVC participation, schooling, and polity exert a positive impact on manufacturing value added growth for our full sample. As for the agriculture GVCs, higher forward participation in total agriculture, crop cultivation and animal production boosts manufacturing growth. As these sectors integrate into global markets through exporting, the domestic demand for manufactured goods might increase. Lastly, higher backward participation in crop cultivation decreases manufacturing growth. This result might indicate that backward GVC participation in crops can crowd out manufacturing growth through substitution of imported inputs.

We also investigate whether the income level of countries matters for the effects of agriculture GVCs on manufacturing growth. Because one would expect that the developing countries are more prone to the Dutch disease/resource curse by the higher integration of agricultural GVCs than developed ones due to their institutional trajectories or absorptive capacity. We provide our empirical results in the 4th to 9th columns of Table 2 for manufacturing in both developing and developed countries. In developing countries, forward participation in agriculture, crop cultivation and animal production significantly and positively impact manufacturing growth. This outcome may stem from the strong domestic linkages between agriculture and manufacturing in these economies which amplify the multiplier effect on manufacturing (Johnston and Mellor 1961). The positive impact of agricultural forward GVCs might be also explained by export revenues which can be utilised as investments for industrialisation (Roemer 1979).

Unlike in developing countries, forward linkages in animal production crowds out manufacturing growth in developed countries. This outcome may be attributed to the resource allocation effects. In developed economies, engaging in forward linkages within animal production might divert resources away from manufacturing. Indeed, an expansion in forward GVC linkages of animal production might require more land, labour and capital, therefore the opportunity cost of using these resources for manufacturing increases. Lastly, backward participation in crop cultivation and animal production has mixed impacts on manufacturing growth. This effect could arise because inputs imported from crop cultivation might replace domestic inputs, while those from animal production are more likely to enhance the complementarities in the manufacturing production.

To gain more insights for our empirical results, we compare the agricultural GVC participation patterns of two economies such as Indonesia (a developing country) and Canada (a developed country). These countries occupy opposite ends of the development spectrum in our sample, allowing us to illustrate how income levels differ the relationship between agricultural GVC participation and manufacturing growth. Figure 1 shows that Indonesia displays a steep rise in agricultural forward participation (FP), from about 11% of exports in 1995 to over 14% in the 2020s, while its backward participation (BP) remains below 3% mostly. This FP-heavy country profile aligns with our regression results showing that exporting agricultural intermediaries is linked to faster manufacturing growth in developing countries. In Figure 2, Canada, maintains a balanced but relatively flat pattern – FP around 7% and BP around 4–5% – and our estimates indicate that, in developed economies, forward agricultural GVC integration has no discernible effect on manufacturing value added growth. This comparison reinforces our empirical results: it is not mere GVC participation *per se*, but rather its direction and the country's level of development that determine whether agricultural GVC integration contributes to manufacturing growth.

Table 3 presents the IV-2SLS results for resource-based and non-resource-based manufacturing sectors by using Kjöllerström and Dallto's (2007) taxonomy. A detailed list of these sectors is provided in Table S2 (ESM). Because one would expect that agricultural GVC participation could generate complementarity or spillover effects on manufacturing sectors, depending on technological intensity and natural resource utilisation. The IV-2SLS estimates in Table 3 show that the coefficients for agricultural GVCs have effects on resource-based manufacturing sectors that are similar to those observed in manufacturing. However, the impact of animal production backward GVCs considerably differs. We find that higher backward participation in animal production leads to higher growth in non-resource-based manufacturing. Backward participation in animal production is often associated with higher levels of technology transfer, skill development, and productivity gains. This linkage may

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Table 2. Manufacturing growth and agricultural GVCs: The IV-2SLS estimations

	Full sample			Developing countries			Developed countries		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
log *(K/L)*	–1.525*** (0.241)	–1.575*** (0.239)	–1.541*** (0.229)	–1.799*** (0.284)	–1.858*** (0.285)	–1.517*** (0.267)	–0.746** (0.365)	–0.795** (0.364)	–1.006*** (0.368)
Manufacturing GVC	0.059*** (0.018)	0.063*** (0.018)	0.057*** (0.019)	0.021 (0.026)	0.020 (0.026)	0.013 (0.027)	0.090*** (0.021)	0.096*** (0.021)	0.087*** (0.020)
Polity	0.455*** (0.035)	0.450*** (0.034)	0.443*** (0.036)	0.349*** (0.036)	0.342*** (0.036)	0.343*** (0.038)	0.338*** (0.076)	0.403*** (0.075)	0.261*** (0.077)
Secondary school enrolment	0.020*** (0.007)	0.019*** (0.007)	0.022*** (0.007)	–0.026* (0.014)	–0.025* (0.014)	–0.021 (0.015)	0.031*** (0.004)	0.031*** (0.004)	0.033*** (0.004)
Agriculture BP	0.027 (0.022)			–0.020 (0.033)			0.022 (0.023)		
Agriculture FP	0.056*** (0.020)			0.090*** (0.029)			0.022 (0.018)		
Crop BP		–0.040* (0.020)			–0.048 (0.030)			–0.050** (0.022)	
Crop FP		0.083*** (0.022)			0.124*** (0.034)			0.026 (0.017)	
Animal BP			0.021 (0.015)			–0.043 (0.028)			0.045*** (0.017)
Animal FP			0.099*** (0.020)			0.177*** (0.027)			–0.056*** (0.017)
Kleibergen-Paap Wald *F* statistics	4 971.363	3 387.65	4 854.221	5 690.751	4 954.293	5 751.876	1 253.244	853.197	1 644.231
Observations	8 088	8 083	7 859	4 228	4 224	4 046	3 860	3 859	3 813
R^2	0.138	0.140	0.146	0.110	0.113	0.124	0.388	0.390	0.400

*, **, ***significance levels at 10 %, 5% and 1%, respectively; country clustered standard errors are in parentheses; agricultural GVCs are instrumented distance-weighted GVCs, following Owusu (2025); Kleibergen-Paap Wald *F* statistics are provided to ensure that whether instruments are strong enough to explain the endogenous variable, confirming the relevance criterion for valid IV-2SLS estimation

IV-2SLS – instrumental variable-two-stage least squares; *GVC* – global value chain; *K*/*L* – capital intensity; *BP* – backward participation; *FP* – forward participation

Source: Authors' own elaboration

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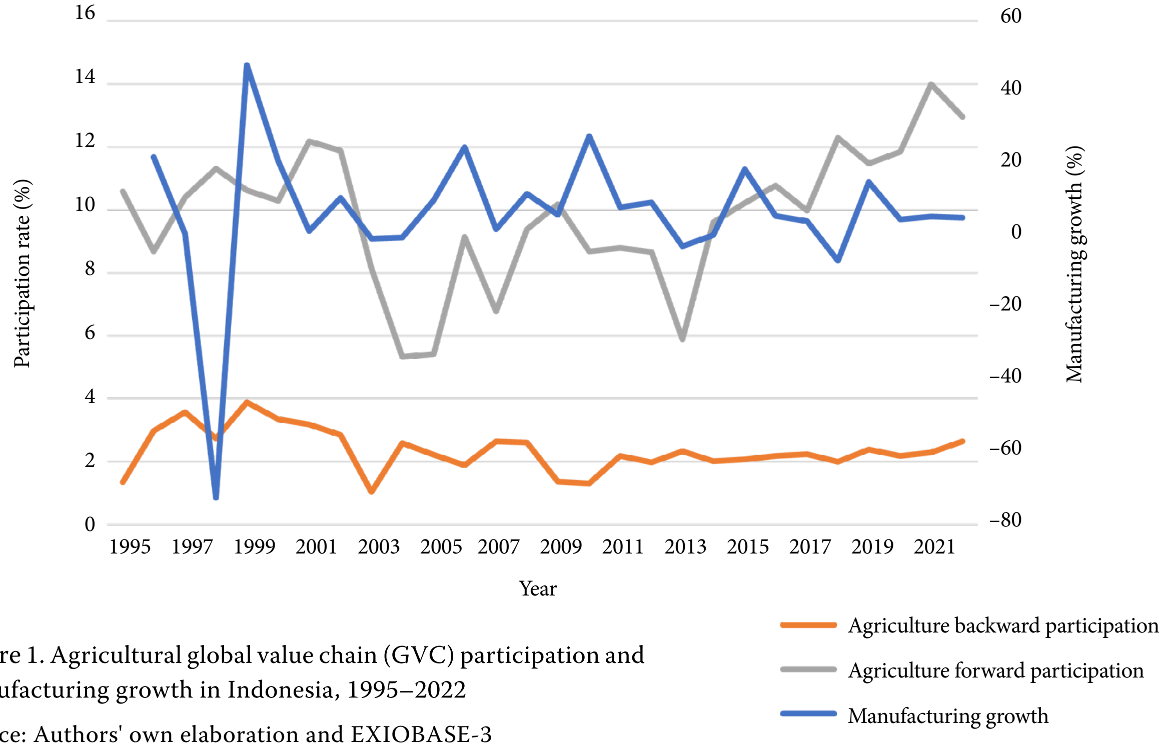

Figure 1. Agricultural global value chain (GVC) participation and manufacturing growth in Indonesia, 1995–2022

Source: Authors' own elaboration and EXIOBASE-3

be attributed to the integration of participating countries into more advanced production networks, which can drive growth in non-resource-based manufacturing through mechanisms such as learning by importing and technology transfer (Halpern et al. 2015). Moreover, we also find that there is a negative impact of backward GVCs in crop cultivation on both resource-based and non-resource-based manufacturing growth which

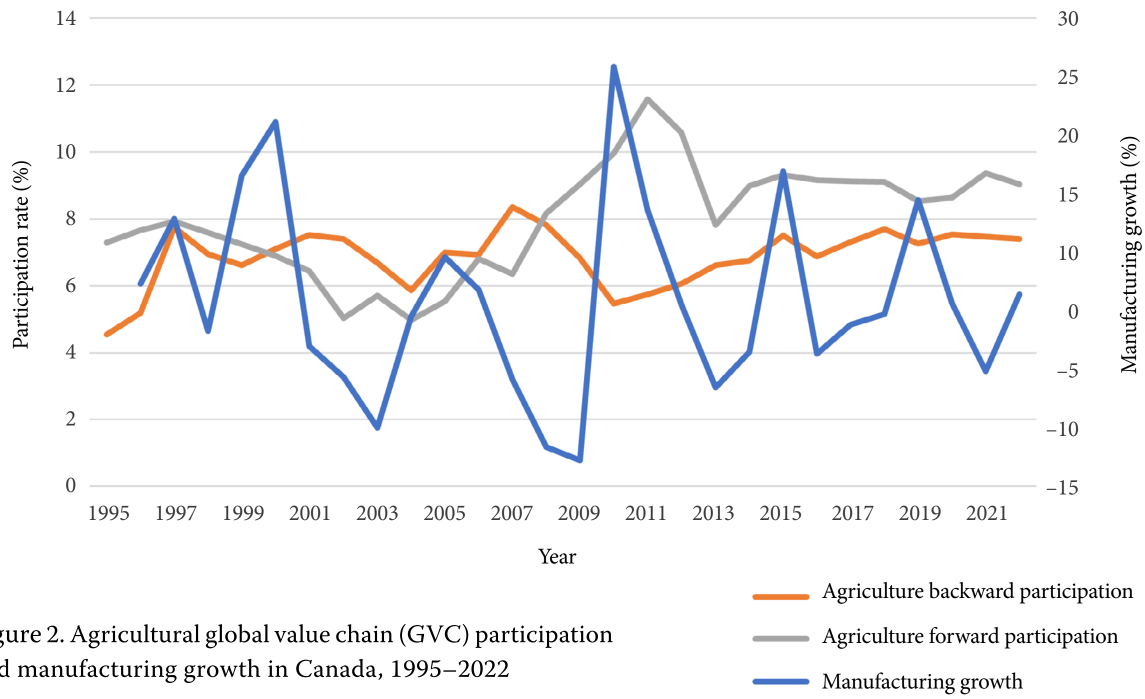

Figure 2. Agricultural global value chain (GVC) participation and manufacturing growth in Canada, 1995–2022

Source: Authors' own elaboration and EXIOBASE-3

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Table 3. (Non) resource-based manufacturing and agricultural GVCs: The IV-2SLS estimations

	Resource-based			Non-resource based		
	(1)	(2)	(3)	(4)	(5)	(6)
log *(K/L)*	−1.694*** (0.223)	−1.727*** (0.220)	−1.681*** (0.214)	−1.128*** (0.213)	−1.195*** (0.206)	−1.049*** (0.207)
Manufacturing GVC	0.035* (0.018)	0.040** (0.018)	0.034* (0.018)	0.049** (0.020)	0.055*** (0.020)	0.054*** (0.020)
Polity	0.486*** (0.034)	0.481*** (0.033)	0.474*** (0.035)	0.378*** (0.041)	0.374*** (0.040)	0.370*** (0.043)
Secondary school enrolment	0.033*** (0.008)	0.032*** (0.008)	0.035*** (0.008)	−0.004 (0.007)	−0.005 (0.007)	−0.002 (0.007)
Agriculture BP	0.015 (0.027)			0.045* (0.024)		
Agriculture FP	0.075*** (0.020)			0.038* (0.023)		
Crop BP		−0.058** (0.026)			−0.048** (0.024)	
Crop FP		0.097*** (0.022)			0.062** (0.025)	
Animal BP			0.001 (0.019)			0.048*** (0.016)
Animal FP			0.106*** (0.020)			0.095*** (0.023)
Kleibergen-Paap Wald *F* statistics	4 966.685	3 383.94	4 850.121	5 132.294	3 476.964	4 475.214
Observations	8 088	8 083	7 859	8 088	8 083	7 859
R^2	0.158	0.160	0.165	0.081	0.081	0.084

*, **, ***significance levels at 10 %, 5% and 1%, respectively; country clustered standard errors are in parentheses; agricultural GVCs are instrumented distance-weighted GVCs, following Owusu (2025); Kleibergen-Paap Wald *F* statistics are provided to ensure that whether instruments are strong enough to explain the endogenous variable, confirming the relevance criterion for valid IV-2SLS estimation

IV-2SLS – instrumental variable-two-stage least squares; *GVC* – global value chain; *K*/*L* – capital intensity; *BP* – backward participation; *FP* – forward participation

Source: Authors' own elaboration

could be linked to weak complementarities, import competition or limited technological spillovers.

To ensure the robustness of our results, we also split our sample by considering natural resource endowment and food trade status. The results are presented in Table S3 (ESM). In resource-poor countries, manufacturing value added growth is positively associated with animal-related backward participation, while backward participation in crop cultivation shows an adverse effect. In resource-rich countries, backward participation in crop cultivation and forward participation in animal production are strongly positive and significant, suggesting that resource-abundant economies are more likely to benefit from agriculture-linked GVCs for higher manufacturing growth. On the other hand, for food-importing

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countries, backward participation in crop cultivation and forward participation in animal production both display negative signs. In food-exporting countries, all forward participation indicators consistently show positive and significant effects, which supports the notion that exporting agricultural intermediaries may stimulate domestic manufacturing.

CONCLUSION

Deriving and utilising disaggregated measures for GVC participation in agriculture in 44 countries from the EXIOBASE-3 database, this study investigates the relationship between agriculture GVC participation and manufacturing growth. Our baseline estimations indicate that forward GVC integration in agriculture, crop cultivation, and animal production supports manufacturing growth while backward participation in crop cultivation hinders it. Additionally, we also investigate how development level changes the impact of agricultural GVCs on manufacturing growth. Forward participation in agriculture, crop cultivation and animal production promote manufacturing growth in developing countries. However, in developed countries, forward GVC participation in animal production hinders manufacturing growth. Our results reflect that exporting agricultural intermediaries may stimulate industrialisation and create some positive spillover effects, challenging the traditional narrative of the resource curse in developing countries. More specifically, our findings also challenge the traditional view that agricultural specialisation necessarily deindustrialises developing countries. In developing countries, agricultural forward integration might act as a channel for higher export revenues, productivity spillovers and demand for manufacturing. In this line, agricultural GVCs can play a decisive role for structural transformation.

Our results also imply that agricultural GVCs have substantially different effects on manufacturing growth depending on the resource reliance of manufacturing sectors. We indicate that the effects of agricultural GVCs on resource-based manufacturing sectors are consistent with those observed in manufacturing. However, the impact of backward GVC participation in animal production shows notable differences. Our findings indicate that increased backward participation in animal production significantly boosts growth in non-resource-based manufacturing, but it has no impact on resource-based manufacturing growth. We also observe that backward GVC participation in crop cultivation adversely affects both resource-based and non-resource-based manufacturing growth.

We can derive several policy implications from our empirical results. Given the positive impact of agriculture forward GVCs on manufacturing growth, countries could prioritise policies such as investing in agricultural technology, education, and R&D to promote manufacturing growth. Our empirical results indicate that development level countries matter for the impact of agricultural GVC participation on manufacturing growth. Given the beneficial impact of forward GVC integration in animal production in developing countries, policymakers should tailor their strategies accordingly. The policies should focus on strengthening forward linkages in animal production by promoting agro-processing industries, enhancing infrastructure, and supporting smallholder farmers' integration into global markets. These efforts would help maximise the benefits of agricultural GVCs on the manufacturing performance. Finally, establishing a reliable supply chain between agricultural industries and manufacturing could be crucial for enhancing the overall competitiveness for developing countries.

Despite its contributions, the study has some limitations. First, our empirical analysis is constrained by data availability. For instance, EXIOBASE-3 provides country-sector-to-country level value added flows, which allows us to measure how a specific sector in one country contributes to the exports of another country in aggregate. However, it does not capture the full country-sector-to-country-sector granularity that would allow us to trace precise sector-to-sector value chains across borders. Lastly, although we focus on value added growth in manufacturing, future studies could examine employment effects, productivity spillovers, and environmental trade-offs of agricultural GVC integration.

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