

Not all GVCs are equal: Forward vs. backward participation and FDI job creation across EU regions

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Abstract. This study examines how participation in global value chains (GVCs) shapes jobs created by greenfield foreign direct investment (FDI) across the EU-27 in 2003–2023. Using project-level FDI data and a country–sector panel, we estimate a labor-demand function with system GMM to address endogeneity. We distinguish forward participation (domestic value added in exports) from backward participation (reliance on imported inputs) and consider GVC position, sector productivity, and wages. Results show that forward participation increases FDI-related job creation by strengthening capacity and production efficiency; the effect attenuates when productivity and wages are controlled. Backward participation generally reduces FDI-generated jobs, consistent with the offshoring of labor-intensive stages; however, the negative effect weakens when trade openness and fixed effects are considered. Regional analysis confirms the pattern but reveals smaller coefficients and highlights the role of regional diversification, infrastructure, and skills. Heterogeneity matters: old EU members and high-tech sectors gain more from forward integration, whereas new members and low-tech sectors face challenges, especially with backward participation. Policy should reinforce forward linkages, deepen domestic supplier networks, and support upgrading toward downstream, knowledge-intensive activities while aligning with green-transition goals.

Keywords: global value chains (GVCs), forward and backward participation, foreign direct investment (FDI), job creation, European Union (EU-27).

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1. INTRODUCTION

Modern globalization remains deeply interconnected with global value chains (GVCs), which continue to structure the world economy even after the Great Recession and the COVID-19 pandemic. The expansion of GVCs affects not only product and service markets but also labor outcomes through complex production and trade linkages (Farole et al., 2018). Consequently, research on trade and labor markets has evolved from country-level perspectives toward firm- and industry-based analyses that integrate GVC frameworks into employment, wage, and productivity studies.

Recent studies increasingly examine the relationship between GVC participation and labor-market outcomes. Most evidence indicates that integration into GVCs improves employment, productivity, and working conditions, particularly in developing economies (Shepherd, 2013; Hollweg, 2019; Guschanski & Onaran, 2023; Mingyang et al., 2023). Yet the magnitude and direction of these effects depend on development level, sectoral structure, skills, and institutions (Farole et al., 2018; Carneiro et al., 2024). GVCs often promote inclusion by creating opportunities for women, rural, and low-skilled workers (Korwatanasakul et al., 2020), but they can also deepen wage inequality. Routine, offshorable occupations (common among low- and medium-skilled workers) face downward wage pressures (Lewandowski et al., 2023). Upstream specialization correlates with higher wages but primarily in advanced economies (Wolszczak-Derlacz et al., 2023). Moreover, participation in GVCs supports formal employment and gender equality (Carpa & Martínez-Zarzoso, 2022).

Despite extensive empirical evidence, consensus on how GVCs affect employment remains limited (Carneiro et al., 2024). This ambiguity stems from difficulties in isolating GVC effects from other forces, such as trade policy, technological progress, or shifts in global demand and from opposing mechanisms that operate simultaneously (Farole et al., 2018; Golubtsov et al., 2025). As Shingal (2015) notes, the losses from GVC integration are visible and concentrated, while the gains are often diffuse and gradual. This paper investigates how GVC integration influences domestic job creation in the European Union (EU), focusing on employment generated through foreign direct investment (FDI). While numerous studies explore the GVC-FDI nexus, only Bai et al. (2024) directly assess job creation through FDI, applying a cross-country input-output framework. Our study builds upon this literature in three key ways.

First, we employ micro-level data on greenfield FDI projects rather than aggregate employment. Analyses based on total employment risk conflating GVC effects with unrelated macro- and microeconomic factors such as business cycles, education levels, or labor-market reforms. By focusing on jobs created through FDI inflows (an inherently trade-linked channel; OECD, WTO & World Bank, 2014), we provide a clearer measure of employment driven by GVC participation. Second, we address functional heterogeneity within the EU, often overlooked in prior research. While most studies contrast developed with developing economies, Kordalska et al. (2022) identify a divide within the EU itself: Central and Eastern European (CEE) countries function as “factory economies” engaged mainly in fabrication tasks, whereas Western EU-15 countries serve as “headquarter economies” concentrated in knowledge-intensive pre- and post-fabrication activities. We test whether these functional differences condition the employment effects of GVC integration. Third, we use a novel dataset from the fDi Markets database (Financial Times), which records individual cross-border greenfield investment projects from 2003 to 2023. These data enable a detailed analysis linking FDI projects to employment outcomes across sectors and years, capturing both structural and temporal dimensions of GVC engagement.

Our contribution is twofold. Empirically, we provide new evidence on how GVC participation affects FDI-related job creation within advanced economies, applying a functionally differentiated, micro-level perspective. Conceptually, we extend the debate on how varying integration modes (production-based

versus knowledge-intensive) translate into employment outcomes within the EU's evolving economic structure.

The remainder of the paper is structured as follows. Section 2 reviews theoretical and empirical literature on GVCs and employment. Section 3 outlines the data, variables, and empirical model. Section 4 presents and discusses the results. Section 5 concludes with key insights and policy implications.

2. LITERATURE REVIEW

The theoretical foundations of this paper draw on the theories of trade in intermediate goods (Helpman, 1985), the fragmentation of production (Jones & Kierzkowski, 2001), and the determinants of GVC participation (Gereffi & Fernandez-Stark, 2018). These approaches highlight the growing importance of trade in intermediates and the role of financial factors and investment in enabling production fragmentation. Several studies emphasize foreign direct investment (FDI) as the key driver of GVC expansion in recent decades (OECD, WTO, World Bank, 2014). Empirical evidence supports this view: Li & Choi (2019), Linh (2024) and Okah-Efogo et al. (2022) confirm a positive impact of FDI on GVC participation across diverse country samples. Qiang et al. (2021) show that countries' positions in the global FDI network strongly correlate with their GVC centrality, while Adarov (2021) demonstrates that both networks share a core–periphery structure dominated by a small group of highly interconnected economies.

The role of multinational enterprises (MNEs) is central to this relationship and justifies using FDI-driven job creation as an analytical focus. MNEs are the main agents linking investment and trade within GVCs. As they expand globally, they internalize production and service activities through complex subsidiary networks. Studies for Europe confirm that MNEs dominate value creation in manufacturing and services (Gao et al., 2023), while Fortanier et al. (2020) find that their exports contain higher import content than those of domestic firms, reflecting deeper backward linkages. Using an input–output model, Bai et al. (2024) estimate that MNEs contribute between 7% and 8% of global employment in GVCs, reaching up to 14% in high-income countries and over 22% in high-tech manufacturing.

The link between GVC participation and employment outcomes can be traced back to classical trade theory. The Heckscher–Ohlin model associates comparative advantage with factor endowments, while Melitz (2003) demonstrates that trade liberalization reallocates resources toward productive, export-oriented firms employing skilled labor. Bernard et al. (2007) add firm heterogeneity to the Helpman–Krugman model and show that trade raises labor demand in competitive sectors while destroying jobs in others. Grossman and Rossi-Hansberg (2008) identify three mechanisms shaping labor outcomes: the productivity effect (efficiency gains from offshoring), the relative price effect (redistribution of income across skill groups), and the labor supply effect (reduced domestic demand for low-skilled work).

Traditional trade theories, however, largely focus on final goods. Recent frameworks adapt these ideas to fragmented production and to intermediate goods, which are the main objects of trade in GVCs. Taglioni and Winkler (2016) identify three transmission channels linking GVCs and labor markets in developing countries: the demand effect (MNE participation increases skilled labor demand), the skill-upgrading effect (workers receive training from MNEs), and the spillover effect (skills transfer from foreign to local firms). In advanced economies, Farole et al. (2018) highlight three partially offsetting effects: the substitution effect (domestic labor replaced by foreign workers), the productivity effect (outsourcing increases efficiency and reduces labor intensity), and the scale effect (cost reductions stimulate output and employment). The net impact depends on which channel dominates.

Recent research shifts attention to factors mediating the GVC–employment nexus, particularly the distinction between forward and backward participation and sectoral heterogeneity (Meng & Wei, 2020). Forward participation, associated with exporting intermediate goods, tends to benefit medium- and high-

skilled workers, while backward participation, reliant on imported inputs, can generate more low-skilled jobs but may substitute domestic production (Oladapo & Raifu, 2022; Mingyang et al., 2023).

Previous empirical findings can be grouped into three main strands. (1) Country-specific studies show positive, though varied, effects of GVC integration. Examples include India (Banga, 2017; Guha-Khasnobis et al., 2023), Turkey (Dine, 2019), Vietnam (Long et al., 2019), Thailand (Korwatanasakul et al., 2020), Nigeria (Oladapo & Raifu, 2022), and South Africa (Ndubuisi & Owusu, 2023). (2) Multi-country analyses explore cross-regional differences. Shepherd (2013) and Hollweg (2019) find employment gains in developing economies; Gunnella et al. (2017) confirm positive effects for advanced economies and Nikulin & Szymczak (2020) and Kersan-Škabić (2024) for Central and Eastern Europe show regional heterogeneity; while Duarte & Castilho (2024) and Szymczak & Wolszczak-Derlacz (2021) identify distinct outcomes by income group. (3) Sectoral studies underline that manufacturing drives most employment effects. Research on electronics (Shepherd, 2013), textiles and apparel (Shingal, 2015), and high-tech industries confirms that GVC participation boosts jobs, though services show weaker linkages.

The skill bias of GVC-related employment is a consistent pattern. Feenstra and Hanson (1996) show that outsourcing raises demand for skilled labor in both developed and developing countries. Caraballo and Jiang (2016) document a global shift from low-skilled to medium- and high-skilled occupations in export-oriented sectors. Gunnella et al. (2017), Kuzior et al. (2025) and Szymczak & Wolszczak-Derlacz (2021) find similar evidence for advanced economies, where gains accrue mainly to capital owners and high-skilled workers (Carpa & Martínez-Zarzoso, 2022).

In developing countries, the effects are generally positive but heterogeneous. Shepherd (2013), Hollweg (2019), and Mingyang et al. (2023) confirm that GVC participation fosters job creation directly in exporting industries and indirectly through linkages with local suppliers. Yet Farole (2016) points to mixed outcomes with both winners and losers. Duarte and Castilho (2024) further note that employment impacts depend on whether a country's integration is forward- or backward-oriented.

There is still no consensus on which groups of economies benefit most. Mingyang et al. (2023) argue that employment gains are stronger in developing nations, while Carneiro et al. (2024) suggest that structural constraints—such as limited skills, weak institutions, and dependence on low-value segments—reduce these benefits. Sectoral differences reinforce this asymmetry: manufacturing remains the primary engine of job creation in emerging economies (Winkler et al., 2023), whereas business services dominate in high-income countries. Overall, the employment effects of GVCs are context-dependent, shaped by functional specialization, skills, and policy frameworks that determine whether integration promotes upgrading or dependence.

3. EMPIRICAL MODEL AND DATA

3.1. Empirical model

To examine whether participation in global value chains (GVCs) is associated with job creation from foreign direct investment (FDI), we estimate the following labor demand function:

$$\ln(\text{Jobs}_{sit}) = \beta_1 \text{GVC}_{sit} + \beta_2 \text{GVC_pos}_{sit} + \beta_3 X'_{it} + \beta_4 Z'_{sit} + \alpha_s + \alpha_i + \alpha_t + \varepsilon_{sit} \quad (1)$$

where $\ln(\text{Jobs}_{sit})$ is the natural logarithm of the number of jobs created by FDI in sector s , country i , and year t , with sectors defined at the two-digit NACE Rev. 2 level. GVC_{sit} is the GVC participation index and GVC_pos_{sit} the position of GVC participation (e.g., upstream or downstream position). X'_{it} is a vector of control variables specific to country i , and year t , while Z'_{sit} includes sector-specific variables. X'_{it} includes

GDP growth rate, country-level productivity, total trade and the national spending on education, while Z'_{sit} accounts for the sectoral productivity defined as the value added per employee and the sectoral average wage. These controls ensure that the impact of GVC participation on job creation by FDI is accurately isolated by accounting for overall economic performance, efficiency, and human capital quality at the national level, as well as efficiency and labor cost variations across sectors.

We include sector fixed effects (α_s) to control for unobserved sector-specific factors such as industry-specific regulations, technological advances, production processes, and market structures; country fixed effects (α_i) to control for unobserved country-specific factors such as national policies, legal systems, cultural factors, economic stability, and the overall investment climate; and time fixed effects (α_t) to control for unobserved time-specific factors such as global economic conditions, technological innovations, and changes in international trade policies. The use of fixed effects addresses several issues, such as the potential concentration of GVC in industries with lower wages, and the impact of time-varying shocks on GVC and employment. Additionally, varying levels of openness among countries influence GVC involvement. ε_{sit} is the error term capturing unobserved factors affecting FDI-induced job creation.

3.2. Data and GVC measurement

We use micro-level data on individual greenfield FDI projects from the fDi Markets Crossborder Monitor database – the most comprehensive source of cross-border investment projects for the EU-27. The dataset covers all projects between 2003 and 2023 and reports the investor country, host country, sector, region, number of jobs created, and industry classification. Accordingly, $\ln(\text{Jobs}_{sit})$ in equation (1) is measured as the natural logarithm of jobs created by FDI, aggregated to the sectoral (two-digit NACE Rev. 2) level using the correspondence tables from Kordalska et al. (2022). Although we initially disregard regional heterogeneity (as other variables are at sectoral or national levels), we later include regional variation as a robustness check. GVC participation is decomposed into forward and backward components, as follows:

$$\text{Forward GVC Participation}_{sit} = \frac{V_{GVC}}{Va} \quad (2)$$

$$\text{Backward GVC Participation}_{sit} = \frac{Y_{GVC}}{Y} \quad (3)$$

where: V_{GVC} is the GVC-related components of value-added in exports; Va is the total value added; Y_{GVC} is the GVC-related component of final production; and Y is the total final production; all at the sectoral level.

The relative position of a sector in a GVC is represented by the ratio of forward to backward GVC production length, whereby the average production length forward is calculated as the ratio of GVC-related domestic value-added to its induced gross output; and the average production length backward is calculated as the ratio of GVC-related foreign value-added to its induced gross output (Wang et al. 2017). More specifically:

$$\text{GVC_pos}_{sit} = \frac{\frac{V_{GVC}}{Y_{Domestic}}}{\frac{Y_{GVC}}{Y_{Foreign}}} \quad (4)$$

When $\text{GVC_pos}_{sit} > 1$, the sector is more forward-oriented in the GVC, indicating that it adds significant domestic value to exports relative to its reliance on foreign inputs. Conversely, the sector is more backward-oriented in the GVC, relying more heavily on foreign inputs relative to the domestic value it adds.

To construct these measures, we rely on the OECD Trade in Value Added (TiVA) database, which decomposes gross trade flows into domestic and foreign value-added components. Specifically, we approximate the forward link by *domestic value added in gross exports* and the backward link by *gross imports of intermediate products*, each expressed as a share of value added and gross production, respectively. TiVA thus provides a comprehensive and internally consistent basis for capturing sectoral GVC participation and positioning across EU economies.

Country-level controls (GDP growth, GDP per person employed, trade openness, and government spending on education) are taken from the World Bank's World Development Indicators, while sector-level controls (value added per worker and average wage at the two-digit NACE Rev.2 level) come from the UNIDO Industrial Database. GVC indicators are constructed from OECD TiVA; GVC position is proxied using the upstreamness–downstreamness measures of Mancini et al. (2024). For consistency across sources, the final panel spans 2003–2020, whereas project-level FDI data are available for 2003–2023.

3.3. Estimation strategy and endogeneity concerns

Equation (1) is estimated using the two-step system GMM estimator, which addresses potential endogeneity through internal instrumentation – specifically, lagged levels and differences of endogenous regressors (Arellano & Bover, 1995; Blundell & Bond, 1998). This approach is suitable for panels with many cross-sectional units and a moderate time dimension, as in our case. To prevent instrument proliferation, we employ instrument reduction, collapsing, and lag-depth restrictions.

Endogeneity in this framework can arise from several sources. (i) Two-way causality between FDI and employment: Greenfield FDI directly creates jobs, yet expected labor availability and skill composition also attract FDI inflows (Pantelopoulos, 2022). (ii) Two-way causality between GVC participation and FDI: Deep GVC integration attracts investors through network efficiency and supplier reliability, while FDI itself strengthens GVC participation via technology transfer and export access (Martínez-Galán & Fontoura, 2019; Okah-Efogo et al., 2022). (iii) Omitted variables: Institutional quality, macroeconomic stability, infrastructure, and investment-promotion policies may influence both GVC intensity and FDI-induced employment. Sector, country, and time fixed effects absorb unobserved heterogeneity, while the GMM framework further mitigates remaining endogeneity. (iv) Sectoral heterogeneity: High-tech sectors may generate fewer but higher-quality jobs and exhibit longer production chains, while labor-intensive sectors may behave differently. We account for this by including sector fixed effects and performing robustness checks across broad industry groups.

Endogenous variables include GVC_{sit} , GVC_pos_{sit} , and $\ln(Jobs_{sit})$ (when the specification is dynamic). Weakly exogenous controls are treated as predetermined and instrumented in levels. Standard errors are clustered at the country–sector level to allow for arbitrary serial correlation and heteroskedasticity within panels. Diagnostic tests include the first-stage F-statistic for weak identification, the Hansen J-test for overidentifying restrictions, and the Arellano–Bond AR(1) and AR(2) tests for serial correlation in first differences. We monitor the instrument count relative to the number of panels to maintain a conservative ratio and avoid overfitting. Robustness checks involve (i) using separate forward and backward participation measures instead of the composite GVC index; (ii) replacing GVC_pos_{sit} with the upstreamness–downstreamness ratio of Mancini et al. (2024); (iii) alternating the inclusion of sectoral wages and productivity to mitigate potential multicollinearity; (iv) excluding crisis years; and (v) running sub-sample estimations for the CEE “factory economies” and the EU-15 “headquarter economies” to explore functional heterogeneity.

4. EMPIRICAL RESULTS AND DISCUSSION

4.1. Baseline results

The baseline estimates of model (1) are reported in Table 1. Columns (1)–(5) present results for forward GVC participation, while columns (6)–(10) show those for backward participation, with explanatory variables added sequentially. The underidentification and Hansen J tests confirm the validity of the instruments, and the Arellano–Bond diagnostics indicate well-specified dynamics.

Results show that forward GVC participation has a positive and significant effect on FDI-related job creation. A higher domestic value added in exports, reflecting deeper integration into the export side of GVCs, increases employment generated by foreign investors. This effect likely arises because stronger forward linkages enhance local supplier capacity, production efficiency, and market reliability, all of which attract FDI. However, the magnitude of this effect declines when sectoral productivity and wages are included, implying that part of the observed impact stems from sectoral characteristics that themselves attract investment. Higher productivity and better-paid industries tend to generate more FDI-related jobs independently, absorbing part of the forward GVC effect.

Backward GVC participation, by contrast, shows a negative relationship with employment. Sectors that rely more on imported intermediates experience fewer FDI-induced jobs, suggesting that outsourcing and reduced domestic production limit local labor demand. Reliance on foreign inputs may also signal weaker domestic competitiveness, reducing the attractiveness of such sectors to investors seeking robust local supply chains. Yet this negative association disappears when sectoral wages and time-invariant factors are added, while total trade becomes positive and significant. This shift suggests that the broader benefits of trade can offset the labor-reducing impact of backward participation, particularly when higher wages signal skilled labor and stable demand. The result is consistent with the 'new new trade theory' associated with Melitz (2003), which emphasizes firm heterogeneity and within-industry reallocation following trade liberalization.

The coefficients for GVC position are negative, indicating that FDI in upstream sectors – further from final demand – creates fewer jobs than investment in downstream sectors. Activities closer to final assembly or consumer services are more labor-intensive and thus more effective in generating employment. This suggests that encouraging FDI in sectors closer to the end consumer yields stronger job-creation effects. Upstream industries tend to be more capital-intensive and technologically advanced, explaining the weaker employment response observed in these segments.

Adding additional control variables also clarifies several relationships. Sectors with higher productivity and wages consistently attract more FDI-generated jobs, reflecting greater efficiency, skill intensity, and market potential. In contrast, higher aggregate productivity at the country level is associated with lower job creation, as more advanced economies rely increasingly on capital and technology rather than labor expansion. Overall, the findings show that forward GVC integration stimulates FDI-driven employment by embedding domestic value in exports, while backward participation constrains it through import dependence. Productivity and wage dynamics mediate these relationships, highlighting the dual role of efficiency and labor cost structures in shaping how global value chain participation translates into domestic job outcomes.

Table 1

Baseline results

	Dependent variable: Log of number of jobs created by FDI									
	Forward participation					Backward participation				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
GVC participation	0.941*** (0.088)	0.959*** (0.088)	0.994*** (0.090)	0.845*** (0.104)	0.536*** (0.116)	-1.164*** (0.140)	-1.145*** (0.139)	-1.130*** (0.134)	-0.866*** (0.177)	-0.156 (0.212)
GVC position		-0.816*** (0.194)	-0.729*** (0.195)	-0.740*** (0.229)	-0.671*** (0.227)		-0.528*** (0.197)	-0.453** (0.197)	-0.466** (0.230)	-0.449* (0.226)
GDP growth rate			0.0264 (0.042)	0.00797 (0.042)	0.00817 (0.041)			0.035 (0.042)	0.00719 (0.042)	-0.015 (0.041)
Log of GDP per person employed			-1.716* (0.883)	-2.862*** (0.828)	-2.821*** (0.818)			-1.263 (0.890)	-2.699*** (0.813)	-3.213*** (0.815)
Government spending on education			0.0996 (0.103)	0.207* (0.118)	0.184 (0.116)			0.104 (0.101)	0.167 (0.116)	0.142 (0.115)
Trade			0.009 (0.007)	0.00912 (0.007)	0.00799 (0.006)			0.007 (0.007)	0.0112* (0.006)	0.00988* (0.006)
Log of sectoral productivity				0.206* (0.121)					0.183 (0.127)	
Log of sectoral average wage					0.297*** (0.054)					0.415*** (0.061)
Constant	2.583*** (0.201)	3.343*** (0.278)	22.12** (9.954)	32.35*** (9.552)	28.17*** (9.327)	3.114*** (0.198)	3.609*** (0.276)	17.28* (10.050)	30.36*** (9.359)	30.02*** (9.185)
Observations	3424	3424	3339	2586	2598	3451	3451	3366	2629	2641
R-squared	0.507	0.509	0.517	0.522	0.534	0.506	0.507	0.514	0.521	0.534
Underidentification test (Kleibergen-Paap rk LM statistic, p-value):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hansen J statistic (overidentification test of all instruments, p-value):	0.397	0.476	0.679	0.455	0.586	0.39	0.361	0.677	0.533	0.622

Source: Authors' estimates.

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Robust standard errors are reported in parentheses. The regressions include sector, country, and time fixed effects, which are not reported but are available on request.

4.2. Results with some regional variation

This subsection exploits the regional detail in the fDi Markets Crossborder Monitor to test whether our baseline findings are robust once within-country heterogeneity is considered. The database reports the host region of each project, which allows us to re-specify the dependent variable as $\ln(\text{Jobs}_{sit})$ with r denoting the region. Because multiple projects may arrive in the same region–sector–country–year cell, we aggregate project-level jobs accordingly. Estimations retain the sector, country and year fixed effects used in the baseline, and add region dummies to absorb time-invariant regional characteristics. Results are reported in Table 2.

The core pattern remains. Forward GVC participation is positively associated with FDI-induced employment at the region–sector–country level. Sectors that embed more domestic value added in exports create more jobs when foreign projects arrive. The magnitude of this effect is smaller than in the national specification, and its attenuation is statistically meaningful once sectoral productivity and wages are included. This suggests that regional differences in infrastructure, workforce skills and industrial composition mediate the gains from forward integration, and that part of the baseline forward coefficient captured the concentration of FDI in capability-rich regions.

Table 2

Results – regional variations

	Dependent variable: Log of number of jobs created by FDI									
	Forward participation					Backward participation				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
GVC participation	0.900*** (0.111)	0.918*** (0.110)	0.968*** (0.115)	0.819*** (0.137)	0.556*** (0.153)	-1.047*** (0.146)	-1.034*** (0.144)	-1.054*** (0.138)	-0.766*** (0.197)	-0.162 (0.235)
GVC position		-0.793*** (0.228)	-0.689*** (0.227)	-0.599** (0.254)	-0.606** (0.253)		-0.575** (0.228)	-0.489** (0.226)	-0.361 (0.253)	-0.403 (0.250)
GDP growth rate			0.0647 (0.048)	0.0359 (0.045)	0.0295 (0.043)			0.062 (0.048)	0.0217 (0.044)	-0.00402 (0.043)
Log of GDP per person employed			-0.543 (1.119)	-2.101** (1.016)	-2.083** (0.989)			-0.324 (1.119)	-2.165** (0.992)	-2.653*** (0.976)
Government spending on education			0.0791 (0.111)	0.199 (0.132)	0.173 (0.129)			0.0599 (0.109)	0.132 (0.129)	0.111 (0.128)
Trade			0.0018 (0.009)	0.00612 (0.008)	0.00578 (0.007)			0.000764 (0.009)	0.00905 (0.007)	0.00914 (0.007)
Log of sectoral productivity				0.129 (0.133)					0.129 (0.147)	
Log of sectoral average wage					0.225*** (0.068)					0.368*** (0.075)
Number of regions affected	0.170*** (0.024)	0.163*** (0.024)	0.156*** (0.025)	0.122*** (0.027)	0.102*** (0.028)	0.144*** (0.025)	0.141*** (0.025)	0.135*** (0.025)	0.111*** (0.028)	0.0853*** (0.028)
Constant	3.027*** (0.338)	3.801*** (0.419)	9.792 (12.650)	24.78** (11.770)	21.51* (11.480)	3.481*** (0.334)	4.049*** (0.412)	7.674 (12.690)	25.26** (11.470)	24.87** (11.180)
Observations	1,983	1,983	1,965	1,521	1,529	2,014	2,014	1,996	1,550	1,558
R-squared	0.56	0.562	0.561	0.566	0.575	0.56	0.561	0.56	0.571	0.579
Underidentification test (Kleibergen-Paap rk LM statistic, p-value):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hansen J statistic (overidentification test of all instruments, p-value):	0.42	0.38	0.617	0.511	0.565	0.534	0.458	0.714	0.652	0.452

Source: Authors' estimates.

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Robust standard errors are reported in parentheses. The regressions include sector, country, and time fixed effects, which are not reported but are available on request.

Backward GVC participation, defined by reliance on imported intermediates, continues to correlate negatively with employment, but the effect weakens and frequently loses statistical significance after richer controls are added. In the fuller specifications, aggregate trade becomes positively related to jobs, indicating that broader openness can offset the labor-reducing margin of foreign sourcing when regional capabilities and wage structures are favorable.

The GVC position coefficient remains negative, implying that projects located farther upstream from final demand generate fewer jobs than projects in downstream, market-proximate activities. In the variants centered on backward linkages, the magnitude of this upstream penalty is slightly larger, consistent with a setting where imported inputs and capital intensity coincide to depress labor demand in certain regional industries. Although the difference hovers near conventional significance thresholds, it is stable across specifications and aligns with the notion that upstream specializations are less employment intensive.

Table 3 further introduces the number of regions affected by FDI in a given country–year. This variable enters positively and is strongly significant across models. Its interpretation is straightforward: when foreign projects are spatially diversified, total job creation is larger, independent of the other controls. The result points to a diffusion mechanism whereby spreading FDI beyond traditional hubs relaxes local capacity constraints, broadens supplier participation and raises aggregate employment. It also suggests that concentrating projects in a few regions leaves potential gains unrealized elsewhere.

Taken together, the regional evidence reinforces three conclusions. First, forward participation remains the employment-enhancing margin of GVC integration even after accounting for regional heterogeneity, albeit with smaller coefficients once sectoral characteristics are controlled for. Second, the adverse

association of backward participation is not robust to richer specifications, while general trade openness supports jobs. Third, the geographic dispersion of projects matters in its own right: a wider regional footprint of FDI is associated with stronger and more inclusive employment effects.

4. RESULTS WITH SECTORAL AND GEOGRAPHIC VARIATION

The coefficients presented for backward GVC participation in Table 3 provide a different perspective on how engagement in global value chains affects employment outcomes across various geographic and sectoral divisions. Backward GVC participation in the old EU member states does not matter for employment. This could imply that these countries have sufficient domestic capacity and competitive industries that mitigate the potential negative effects of relying on foreign inputs. In the new EU member states, however, the coefficient for backward GVC participation is negative and statistically significant, indicating that greater reliance on imported inputs is associated with lower FDI-induced job creation.

Looking at the sectoral divisions, the results for backward GVC participation provide a complex picture. In labor-intensive sectors, the negative and non-significant coefficient suggests that reliance on foreign inputs does not notably affect employment, which may indicate that these sectors are less dependent on backward GVC participation to create jobs. However, in capital-intensive sectors, the impact is similarly non-significant, but with a very small negative coefficient. This might suggest that capital-intensive sectors do not benefit from backward GVC participation and may even experience slight job losses, as more production is outsourced abroad.

The results in technological division reveal that backward GVC participation has a significant negative impact on employment in low-tech sectors only. This suggests that in industries with low technological content, relying on foreign inputs substantially reduces job creation, possibly because these sectors struggle to compete with cheaper or more efficient foreign producers. In high- and medium-tech sectors, while the coefficient is negative, it is not significant, indicating that these sectors may be better able to integrate foreign inputs without losing jobs.

The impact of GVC position, when backward GVC participation is controlled for, shows a similar result for the new MS. For the rest of disaggregations, the coefficient is statistically insignificant, though consistently negative, suggesting that sectors positioned upstream in the value chain may still experience some reduction in employment, even if the effect is not strong enough to be statistically confirmed across different sectoral or geographic divisions. This could indicate that the challenges associated with being upstream, such as reliance on capital-intensive processes or reduced demand for domestic labor, persist across various contexts, albeit to a lesser extent.

Table 3

Results – sectoral and geographic variation							
	Geographic division		Sectoral division (1)		Sectoral division (2)		
	Old EU-MS	New EU-MS	Labor intensive	Capital intensive	High tech	Medium tech	Low tech
Forward GVC participation							
GVC participation	0.437***	0.154	0.179	0.643***	0.578***	0.797***	-0.136
	(0.155)	(0.233)	(0.349)	(0.134)	(0.178)	(0.252)	(0.389)
GVC position	-0.165	-0.610**	-0.533	-0.553**	-0.079	-1.329***	-0.443
	(0.397)	(0.272)	(0.883)	(0.247)	(0.309)	(0.514)	(1.030)
Backward GVC participation							
GVC participation	0.224	-0.652**	-1.56	-0.093	-0.0046	-0.645	-2.118*
	(0.288)	(0.278)	(1.020)	(0.236)	(0.312)	(0.442)	(1.133)
GVC position	-0.0191	-0.471*	-0.979	-0.29	-0.0217	-0.481	-1.265
	(0.389)	(0.268)	(0.877)	(0.246)	(0.313)	(0.481)	(1.057)

Source: Authors' estimates.

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Robust standard errors are reported in parentheses. The regressions include controls and sector, country, and time fixed effects, which are not reported but are available on request.

5. CONCLUSION

This study examines how participation in global value chains affects job creation from foreign direct investment in the EU-27 from 2003 to 2020. The analysis uses a system GMM labor demand model with sector, country, and time effects. Data combine project level FDI from the fDi Markets Crossborder Monitor with OECD TiVA indicators for agriculture, industry, and construction. Forward participation, measured as domestic value added in exports, increases jobs created by foreign investors through higher productivity, stronger supplier networks, and greater production capacity. The effect becomes weaker after controlling for productivity and wages, which shows that these factors partly explain the link. Backward participation, meaning reliance on imported inputs, reduces FDI related employment but loses significance once wages and fixed effects are included. This suggests that trade openness and skilled labor can offset negative effects. Regional analysis confirms a smaller yet positive role of forward participation and stronger negative effects of backward participation in regions with weaker industrial bases and higher import dependence. A more balanced regional distribution of FDI helps spread the benefits of global value chain integration.

The findings reveal important asymmetries between the old and new EU member states. In the EU-15, deeper forward GVC participation significantly stimulates employment, especially in capital- and technology-intensive sectors. These countries benefit from advanced supplier networks, skilled labor, and established institutions that enable them to capture value from forward linkages. Strengthening participation in high value-added activities and involving local firms and workers, particularly in business services, could further enhance FDI-driven employment. However, achieving this goal must be balanced with commitments under the European Green Deal and the broader Sustainable Development Goals, which also require structural transformation and energy efficiency improvements.

In contrast, the newer EU member states face greater challenges. Both forward and backward linkages fail to generate comparable employment gains, reflecting structural dependence on assembly-based production and limited domestic supplier depth. These economies should prioritize reducing backward participation by expanding networks of domestic suppliers and strengthening technological absorption from foreign firms. Policies fostering stronger linkages between multinational enterprises and local firms—through supplier development, innovation incentives, and skill upgrading—can enhance job creation potential. Moreover, upgrading along the value chain by moving into downstream, knowledge-intensive activities such as design, marketing, and management could shift these economies toward higher value-added segments. Such functional upgrading requires investment in research and development, digitalization, and education, which are critical for breaking the fabrication-based specialization that characterizes Central and Eastern Europe's current role in GVCs.

Overall, the results indicate that EU countries cannot rely on a single model of GVC integration to generate employment. Forward participation consistently supports job creation, while backward participation does not. The employment effects are conditional on institutional maturity, wage structures, and industrial capabilities. For the EU-15, consolidating existing forward positions in GVCs can reinforce sustainable and skill-intensive employment growth. For the newer member states, reducing excessive reliance on foreign intermediates and upgrading into higher value-added activities are essential for ensuring that GVC participation translates into durable employment gains. Future research could explore whether the positive employment effects associated with forward participation also translate into faster economic

growth, as recent evidence suggests that GVCs have fundamentally reshaped both the structure and growth potential of FDI in advanced and emerging economies.

Future work should unpack causal channels using richer microdata (e.g., matched employer–employee records), sharper instruments, and event-study designs around discrete shocks to GVCs and FDI. It would be valuable to trace heterogeneity by task/skill content and by exposure to green-transition policies (e.g., CBAM, energy-efficiency standards), linking GVC positioning to wage ladders and workforce upgrading. Finally, dynamic adjustment paths—entry, scaling, and exit of foreign projects—should be studied to distinguish transitory from persistent employment effects.

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