

Trade and Investment Inter-dependencies in Global Value Chains (GVCs): Analyzing the Challenges and Differences among SMEs in the APEC Region

APEC Committee on Trade and Investment

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**Asia-Pacific
Economic Cooperation**



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Table of contents

Executive Summary	1
CHAPTER I. Trade and investment inter-dependencies in Global Value Chains (GVCs): Analyzing the challenges and differences among APEC economies	3
Introduction	3
1. Understanding Global Value Chains: From Concept to Structural Analysis	4
2. Bibliometric Analysis of the Global Value Chains Literature	8
2.1. Bibliometric studies on GVC	8
Methodology Approach	8
2.2.	8
2.2.1. Sample selection	8
2.2.2. Bibliometric analysis	9
Results	10
2.3.	10
2.3.1. Intellectual structure	10
2.4. Conceptual structure	12
2.4.1. Social structure	13
2.4.2. Main findings of the bibliometric analysis results	14
2.5. Trade Agreements and Economic Integration in the APEC Region	15
2.6. Input-Output Analysis and TiVA Indicators in the APEC Region	19
2.6.1. Data and Method	19
2.6.2. Empirical Analysis	25
Conclusions	41
CHAPTER II. Workshop on trade and investment inter-dependencies in Global Value Chains (GVCs): Analyzing the challenges and differences among SMEs in the APEC region	44
Introduction	44
1. Day 1	46
1.1. Day 1. Presentation 1: Understanding Global Value Chains – Concepts and Analytical Framework	46
1.1.1. Objective and Conceptual Foundations	46
1.1.2. Conclusions and policy reflections	48
1.2. Day 1. Presentation 2: Trade and Investment Inter-dependencies in GVCs: Analyzing the Challenges and Differences APEC Region	49
1.2.1. Objective and Context	49
1.2.2. Main Findings	49

1.2.3.	Conclusions and policy reflections.....	50
1.3.	Day 1. Presentation 3: Internationalization of Companies and Productive Integration.....	52
1.3.1.	Conceptual Foundation.....	52
1.3.2.	Policy Objectives	52
1.3.3.	Analytical Methodology.....	53
1.3.4.	Accumulation of Origin and the CPTPP Framework.....	56
1.3.5.	Digital Platform for Productive Linkages	56
1.3.6.	Relevance for the APEC Discussion	56
1.3.7.	Conclusion	57
2.	Day 2	58
2.1.	Day 2. Presentation 1: The link between trade, production, and SMEs. The theoretical framework and methodology.....	58
2.1.1.	Objective and Context.....	58
2.2.	Day 2. Presentation 2: GVCs: The link between trade, production, and SMEs in APEC region: The empirical evidence.	60
2.2.1.	Objective and Context.....	60
2.2.2.	Main Findings.....	61
2.2.3.	Concluding Insights.....	63
2.3.	Day 2. Presentation 4: GVCs Participation and Economic Growth: Policy Implications.....	65
2.3.1.	Objective and Context.....	65
2.3.2.	Main Insights	65
2.3.3.	Policy Implications and Future Directions.....	66
2.4.	Final Conclusions	69
3.	Analysis of Pre- and Post-Workshop Surveys and Key Findings	70
3.1.	Analysis of the questionnaire pre-workshop.....	70
3.2.	Analysis of the Survey post Workshop.....	73
	FINAL RECOMMENDATIONS	77
	References	78

Trade and investment inter-dependencies in Global Value Chains (GVCs): Analyzing the challenges and differences among APEC region

Executive Summary

How can APEC economies move beyond participation in Global Value Chains (GVCs) to capture a greater share of the value they create? This study analyses the trade and investment inter-dependencies that shape APEC's integration into global production networks, focusing on their evolution, existing asymmetries, and sectoral contributions to value creation. It is organized into two chapters. The first chapter presents a technical study combining three approaches: a bibliometric mapping of GVC research, a network analysis of Regional Trade Agreements (RTAs), and a quantitative assessment of backward and forward linkages (BL and FL) based on the OECD Inter-Country Input-Output tables (ICIO, 2021). This analysis also applies the smile curve framework to identify where value added is concentrated across APEC economies and to trace changes in specialization and value creation from 1995 to 2020. The second chapter summarizes the main presentations, discussions, and survey results from the Workshop "Trade and Investment Inter-dependencies in Global Value Chains: Analyzing the Challenges and Differences among APEC Region," held during APEC SOM3 in Incheon, Korea (August 7–8, 2025).

The bibliometric analysis reveals that the intellectual structure of GVC research has undergone significant evolution. Early work emphasized governance types and manufacturing upgrading, but more recent contributions reflect growing interest in issues such as digital transformation, environmental sustainability, and the resilience of global production systems. Through co-citation and keyword co-occurrence networks, the study identifies three main thematic clusters: (1) governance and upgrading; (2) global supply chains and sustainability; and (3) economic geography and territorial development. This shift in emphasis suggests a broader research agenda that integrates the analysis of value chains with global challenges and local development concerns.

The analysis of APEC's trade integration patterns using social network analysis methodology shows a clear increase in the number and density of intra-regional RTAs, particularly after 2000. While in 1995 only a limited number of APEC economies had signed trade agreements with one another, by 2020 the network had become significantly more interconnected. This expansion of institutional trade links has likely facilitated deeper integration in production networks, especially among Southeast Asian economies. However, some structural asymmetries persist, as not all members exhibit the same level of connectivity or influence within the RTA network.

At the sectoral level, the study uses international input-output data to calculate backward and forward linkages for 45 economic sectors in each APEC economy. The results reveal a relatively stable network structure over time, but with

important shifts in the position of specific industries. In particular, sectors such as chemicals, basic metals, and mining and quarrying have increased their centrality, acting as key suppliers and consumers of intermediate goods. Medium-technology manufacturing and some service activities have gradually gained importance, pointing to an ongoing reconfiguration of regional production toward more complex.

The analysis of Trade in Value Added (TiVA) indicators deepens this structural perspective. By 2020, services accounted for nearly 70% of domestic value added across APEC economies, while manufacturing remained central to export value creation. Export structures differ markedly: Hong Kong, China; Singapore; and the United States; are service-led; China; Korea; and Chinese Taipei rely mainly on manufacturing; and Australia and Indonesia show growing primary-sector contributions. These patterns broadly align with Mudambi (2008) smile curve hypothesis, where higher value is captured at the upstream and downstream stages, but the U-shaped pattern is not uniform, reflecting diverse integration paths among APEC economies.

The second chapter of the study summarizes the discussions and outcomes of the Workshop. The event brought together experts from international organizations, academia, and government agencies to discuss the study's findings and their policy implications. Presentations highlighted that although APEC represents one of the most interconnected production systems in the world, significant asymmetries persist in value capture across economies and sectors. Participants emphasized the need to move from mere participation to value creation by strengthening innovation, cross-economy cooperation, digital integration, and SME involvement. Overall, the chapter reflects a shared understanding that the future of GVCs in APEC will depend on coordinated policies linking trade, investment, and innovation to achieve a more balanced and sustainable form of regional integration.

In conclusion, the study highlights that the APEC region has made important strides in consolidating its position within global production networks, with growing evidence of structural diversification and regional cooperation. Nonetheless, persistent asymmetries in trade agreements, sectoral specialization, and the capture of value added continue to shape the opportunities and constraints faced by member economies. Building on the results of both chapters, the document concludes with a set of policy orientations and strategic recommendations aimed at designing upgrading pathways within GVCs, strengthening innovation, productive linkages, and cooperation among APEC economies.

Keywords: Global Value Chains; APEC Regional Integration; Trade in Value Added; Regional Trade Agreements; Structural Interdependencies.

CHAPTER I. Trade and investment inter-dependencies in Global Value Chains (GVCs): Analyzing the challenges and differences among APEC economies

Introduction

Over the past two decades, international trade has been increasingly shaped by the fragmentation of production and the growing interdependence among economies. In this context, Global Value Chains (GVCs) have emerged as a dominant form of production organization, generating new economic, trade, and institutional dynamics (Gereffi, 1994; Baldwin, 2016). In the case of APEC member economies, this phenomenon is particularly significant due to their strong linkages with global trade networks, foreign direct investment flows, and increasing involvement in knowledge-intensive, manufacturing, and service activities (Timmer et al., 2014; OECD & UNIDO, 2019).

Nonetheless, the ways in which APEC economies participate in GVCs are far from uniform. While some economies or regions have advanced into higher value-added segments, others remain limited to peripheral or extractive roles (Kaplinsky, 2005; Pietrobelli & Rabellotti, 2011). This heterogeneity highlights the need to understand the region's trade and productive structures and the specialization patterns shaping their global insertion. Although research on GVCs has expanded significantly, much of it remains focused on case studies or fragmented empirical perspectives, leaving a gap in comparative, structural analyses of how APEC economies are positioned within global production systems.

This article seeks to address that gap by offering an integrated and multidimensional analysis of literature, trade agreements, and productive structures in APEC member economies. To that end, it combines four complementary approaches: (i) a bibliometric analysis of the GVC literature to identify theoretical perspectives and academic collaboration networks; (ii) a network analysis of Regional Trade Agreements (RTAs) among APEC economies as facilitators of integration into GVCs (Dür et al., 2023); (iii) a structural analysis of forward and backward linkages based on inter-economy input-output matrices (Miller & Blair, 2009); and (iv) an empirical analysis of Trade in Value Added (TiVA) indicators, with particular attention to the distribution of domestic value added across the primary, manufacturing, and services sectors, based on the smile curve framework proposed by Mudambi (2008).

The results highlight both shared patterns and asymmetries in how APEC economies participate in GVCs. For example, findings reveal the consolidation of certain economies as regional hubs, the growing importance of services in value creation, and the persistent disarticulation of some economies that rely primarily on low-value or extractive activities. Overall, the paper contributes to a better understanding of the productive positioning of APEC members and provides

relevant evidence to support policy discussions on upgrading, productive diversification, and territorial development within the Asia-Pacific region.

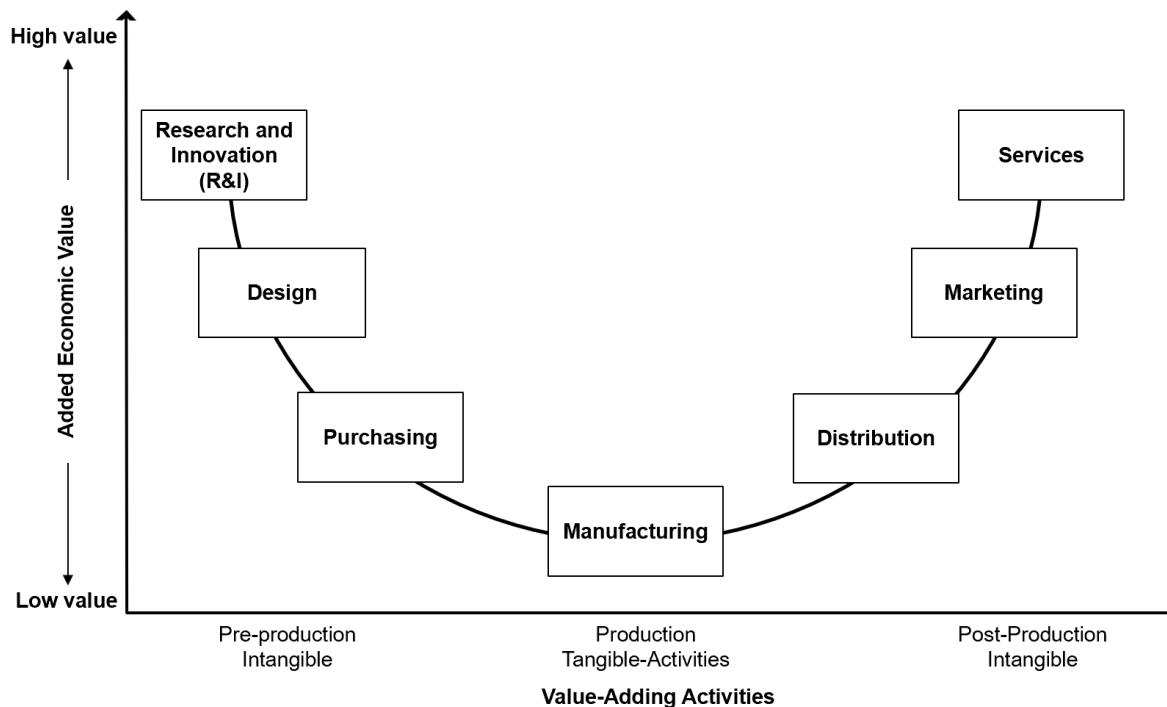
1. Understanding Global Value Chains: From Concept to Structural Analysis

Globalization today is increasingly defined by the fragmentation of production and the cross-border coordination of tasks, rather than by the simple exchange of final goods (Baldwin, 2016; Timmer et al., 2014). Production processes, such as manufacturing, services, and knowledge-intensive activities, are now organized through production networks spanning multiple economies. These globally integrated systems have been conceptualized through overlapping but distinct analytical frameworks: Global Value Chains (GVCs) (Gereffi, 1994; Gereffi & Fernandez-Stark, 2016), Global Commodity Chains (GCCs) (Hopkins & Wallerstein, 1986), and Global Production Networks (GPNs) (Henderson et al., 2002; Coe & Yeung, 2015). While each framework places emphasis on different aspects, including governance, power relations, or spatial embeddedness, they converge in highlighting the implications of globalized production for economic, social, and territorial development (Kaplinsky, 2005; Milberg & Winkler, 2013).

In this sense, a value chain refers to the set of activities involved in transforming raw materials into final products, adding value at each stage of the process. These activities are usually carried out by firms that operate in different segments of the chain, ranging from resource extraction and input production to manufacturing, design, logistics, marketing, and after-sales services (Gereffi & Fernandez-Stark, 2016). As the product moves along the chain, the activities performed by different firms become increasingly connected and coordinated, either through market transactions, contractual relationships, or hierarchical control. When these value chains span across multiple economies or regions, they form what are known as GVCs. Firms engage in GVCs by combining trade, foreign investment, labor mobility, and the transfer of knowledge and technology to optimize their international operations (OECD & UNIDO, 2019).

One of the key insights from GVC analysis is that value is not distributed evenly across the stages of the production process. This is often illustrated using the “smile curve”, a conceptual graph that shows how the value added is typically lower in the middle segments, including manufacturing and assembly, and higher at the upstream and downstream ends, where knowledge-intensive functions like R&D, product design, branding, and marketing take place (Shih, 1996; Mudambi, 2008). In other words, while many developing economies participate in GVCs through manufacturing and commodity exports, the most profitable stages tend to be captured by firms based in advanced economies. This uneven distribution of value highlights the importance of industrial and innovation policies that allow economies to “move up” the value chain and engage in higher-value-added activities.

Figure 1. The Smile Curve: Value Distribution Across Activities in GVCs



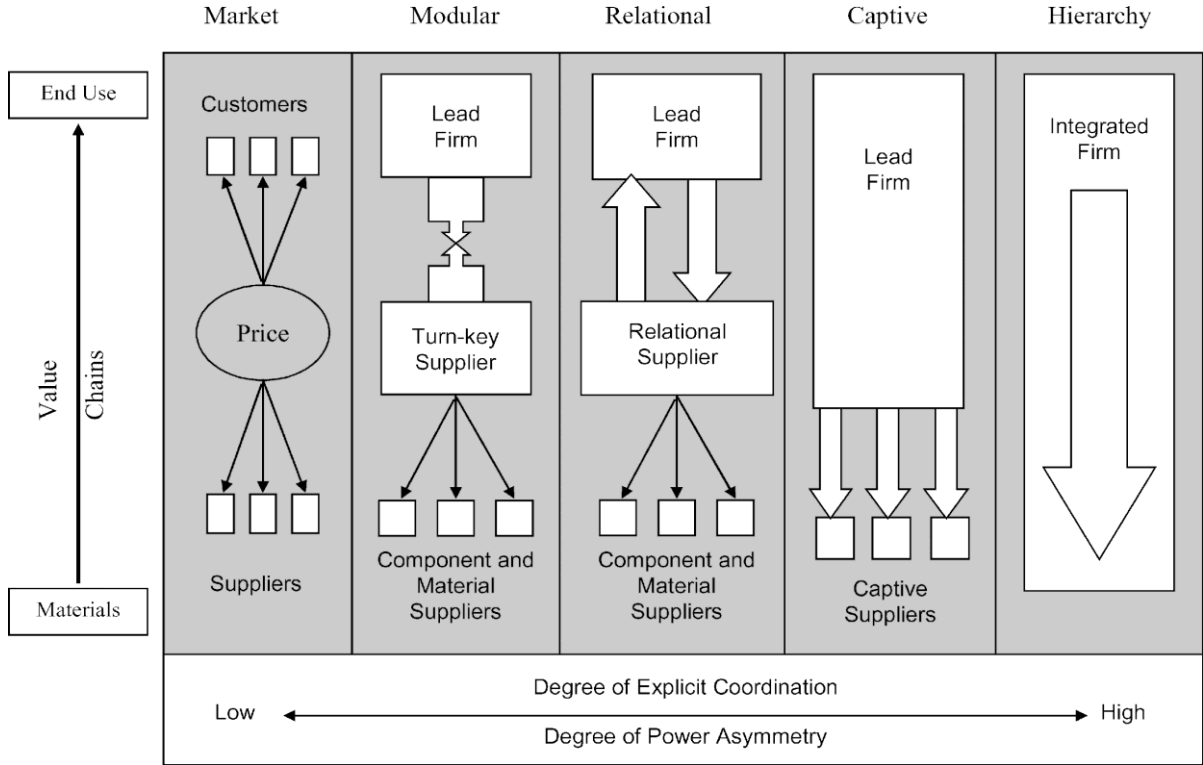
Source: Authors based on Mudambi (2008)

The uneven distribution of value-added highlights the importance of analyzing not only what activities are carried out within GVCs, but also who performs them, where they take place, and under which governance structures they are coordinated. In other words, it is not sufficient to map the sequence of activities, from raw material extraction to final consumption, without considering the underlying power relations and institutional arrangements that shape how value is created and captured. A structural perspective on GVCs advances this understanding by moving beyond descriptive mapping to analyze how global production is organized, how control is exercised, and how upgrading opportunities are distributed across firms, regions, and economies (Gereffi et al., 2005; Ponte & Sturgeon, 2014).

A key focus of this approach is the identification of lead firms, typically large corporations operating across multiple economies, that coordinate the value chain and define the conditions under which other actors participate. These firms do not necessarily own all stages of production, but they exert significant control through different types of governance structures, including **market-based, modular, relational, captive, and hierarchical forms** (Gereffi et al., 2005). Each of these governance types reflects varying degrees of power asymmetry, knowledge transfer, and barriers to entry for suppliers. According to Gereffi et al., (2005), these governance forms emerge from the interaction of three key variables: the complexity of transactions, the ability of suppliers to meet performance requirements, and the degree to which information can be codified and transmitted. Figure 2 summarizes the main characteristics of each governance type, providing a visual overview of how coordination and control are

exercised within GVCs. In parallel, the roles played by lower-tier suppliers, service providers, and public institutions, at both economy-wide and sub-economy levels, are also critical for understanding how productive capabilities are developed and how value is distributed along the chain.

Figure 2. Five global value chain governance types



Source: Gereffi et al. (2005, p. 89).

To facilitate a more comprehensive understanding of the governance structures outlined above, Table 1 presents a synthesized overview of their defining characteristics. It highlights the key features of each governance type, the corresponding degree of power asymmetry between firms, and illustrative examples of industries in which these forms of coordination are commonly observed.

While governance structures help us understand how global production is coordinated and how value is distributed across firms, they also expose underlying asymmetries that condition the terms of participation in GVCs, whether through meaningful inclusion, marginal engagement, or structural disarticulation. Drawing on the disarticulations framework developed by Bair & Werner (2011), disarticulation refers to situations where export-oriented sectors remain detached from the broader domestic economy, limiting developmental spillovers such as local linkages, employment creation, and innovation.

Table 1. Governance Structures in Global Value Chains

Governance Type	Main Features	Power Asymmetry	Examples
Market	Transactions are simple and based on standard products. Coordination is minimal, and price is the main governing mechanism.	Low	Commodity trade, standardized manufacturing inputs
Modular	Suppliers produce customized outputs based on detailed, codified specifications from buyers. Coordination is efficient due to clear technical standards.	Low to moderate	Electronics manufacturing, IT services
Relational	Coordination relies on trust, reputation, and frequent interaction. Knowledge is often tacit and difficult to codify.	Moderate to high	Fashion, automotive components, design services
Captive	Small suppliers are dependent on powerful lead firms, which exert high control and provide technical assistance. Switching costs are high.	High	Apparel production, contract manufacturing in developing economies
Hierarchical	The lead firm owns and manages most or all stages of production through vertical integration. Coordination occurs within the firm.	Very high	Corporations with internalized supply chains spanning multiple economies (e.g., aerospace, semiconductors)

Source: Authors based on Gereffi, et al. (2005).

At the same time, many regions in the Global South remain outside GVCs or engage only through extractive activities with weak domestic linkages. Scholars refer to this condition as disarticulation, a structural disconnect between export-oriented sectors and the broader domestic economy (Kaplinsky, 2000; Pietrobelli & Rabelotti, 2011). Even when these sectors expand in trade volume, they often generate limited domestic spillovers in terms of quality employment, knowledge transfer, or innovation. In such cases, the challenge is not only exclusion from GVCs but integration under conditions that restrict structural development and reinforce dependency rather than transformation.

The conceptual foundations presented in this section offer the basis for analyzing how economies and regions are inserted into GVCs, under what governance structures, and with what developmental implications. To operationalize these ideas, the following sections combine different methodological approaches: a bibliometric analysis to trace the evolution of the academic debate; a network analysis of trade agreements among APEC members to map the institutional structure of regional integration; an input-output analysis to estimate forward and backward linkages across economies and sectors; and the use of TiVA indicators to empirically examine patterns of value capture and the shape of the smile curve.

Together, these tools provide a multidimensional perspective on the structure, intensity, and quality of APEC economies' participation in global production networks.

2. Bibliometric Analysis of the Global Value Chains Literature

2.1. Bibliometric studies on GVC

Recent literature reviews and bibliometric analyses on GVCs demonstrate the field's rapid expansion across disciplines such as economics, management, and economic geography, highlighting its evolution into a complex research domain. Kano et al. (2020) assess key conceptual frameworks and governance issues at multiple levels, identifying underexplored topics like micro foundations, digitization, and macro impacts. Liu & Mei (2016) and Dai & Xu (2024) use visualization and co-occurrence network analyses to map GVC research, revealing its interdisciplinary growth, the dominance of economics and management, and the emergence of new fronts such as digitalization, environmental factors, and AI impacts on GVCs. Meanwhile, Hernandez & Pedersen (2017) focus on GVC configuration, reviewing decisions around location, governance, and coordination, and analyzing performance and upgrading outcomes, while identifying gaps and proposing a research agenda to advance understanding of global organizational strategies.

Based on this growing body of research, the study conducts a comprehensive bibliometric analysis to map the intellectual, conceptual, and social foundations of the GVCs field. The analysis captures the evolution and consolidation of GVC scholarship, highlighting how research has progressively shifted toward issues of governance, technological transformation, and global challenges.

2.2. Methodology Approach

2.2.1. Sample selection

The data were obtained from the Core Collection of the Web of Science (WoS). Although WoS was not specifically designed for bibliometric studies (Ho, 2019), it is widely regarded as the "world's leading database for publications and reports of citations" (Guerras-Martín et al., 2020, p. 126). Its broad coverage, along with its ease of searching and downloading topic-specific data, makes it well-suited for this type of analysis.

The selected editions from the WoS Core Collection included the Science Citation Index Expanded (SCI-EXPANDED), Social Sciences Citation Index (SSCI), Arts & Humanities Citation Index (A&HCI), and Emerging Sources Citation Index (ESCI). The search query was conducted using the keywords "global value chains" and "GVCs", filtered by the following WoS categories: economics, business, geography, environmental sciences, management, environmental studies, development studies, and regional urban planning. Additionally, the

search was restricted to the research areas business economics, environmental sciences & ecology, and geography. The resulting database comprised 6,211 publications, summarized in Table 2.

Table 2. Summary of the bibliographic database on Global Value Chains

Description	Results
Timespan	1985-2025
Sources (Journals, Books, etc.)	947
Documents	6,211
Annual Growth Rate %	14.28
Document Average Age	5.3
Average citations per doc	28.72
References	260,115
Keywords Plus (ID)	7,036
Author's Keywords (DE)	14,817
Authors	14,650
Single-authored docs	983
Co-Authors per Doc	3.15
International co-authorships %	36.79

Source: Author's based on WoS data.

2.2.2. Bibliometric analysis

To conduct this study, we employed bibliometric analysis to identify theoretical and empirical challenges in GVCs research. This quantitative approach is well-suited for examining knowledge domains (White, 2004) and reveals connections between documents, reflecting authors' recognition of prior works, researchers, fields, methodologies, and geographic regions (Hjørland, 2002). By analyzing large datasets, this method helps uncover temporal trends, research themes, and disciplinary shifts (Crane, 1972).

For social network analysis, we used VOSviewer, a software tool designed to construct and visualize network-based maps (Van Eck & Waltman, 2014). According with Aria and Cuccurullo (2017) these maps allow us to observe the intellectual, social, and conceptual structures of GVC literature. Specifically:

- Intellectual structure identifies research communities, their interconnections, and authors' positions within these networks (White & Griffith, 1981). This is achieved through co-citation analysis (examining how often two authors are cited together) and historiographs (timelines tracing the evolution of ideas across publications) (White, 2011).
- Social structure highlights collaborative ties, scholarly influence, and key figures in the field (Newman, 2004), visualized via collaboration networks.
- Conceptual structure focuses on keyword linkages, revealing shared frameworks or ongoing debates (Whorf, 1956). Co-word analysis maps

term associations, exposing emerging trends or focal points (Aria & Cuccurullo, 2017).

Bibliometric studies use network graphs, where nodes represent actors (e.g., authors, publications, keywords), ties refer relationships between them, node colors indicate clusters with shared characteristics, and distances between nodes/clusters reflect cognitive proximity. To interpret these graphs, we assess network structure and intensity of relationship following the methodological approach outlined by Lacobucci (1994):

- Levels of analysis: subgraphs (e.g., dyads, triads, or larger groups).
- Measures of prominence: Evaluated via centrality metrics (Wasserman & Faust, 1994), including:
 - Degree centrality: Number of direct connections.
 - Closeness centrality: Average distance to other nodes.
 - Betweenness centrality: The Frequency a node acts as a bridge

Moreover, the identification of clusters or communities within these networks provides a deeper understanding of the field's internal organization. Each cluster represents a group of closely connected authors, publications, or concepts that share common research interests or methodological approaches. By analyzing these communities, we identified the main intellectual schools, thematic concentrations, and emerging areas of inquiry within the literature. This clustering process allowed us to capture the internal structure of the field, illustrating how areas of research converge and diverge over time. It also provided insights into the evolution of ideas, collaborations, and theoretical approaches shaping GVCs studies.

2.3. Results

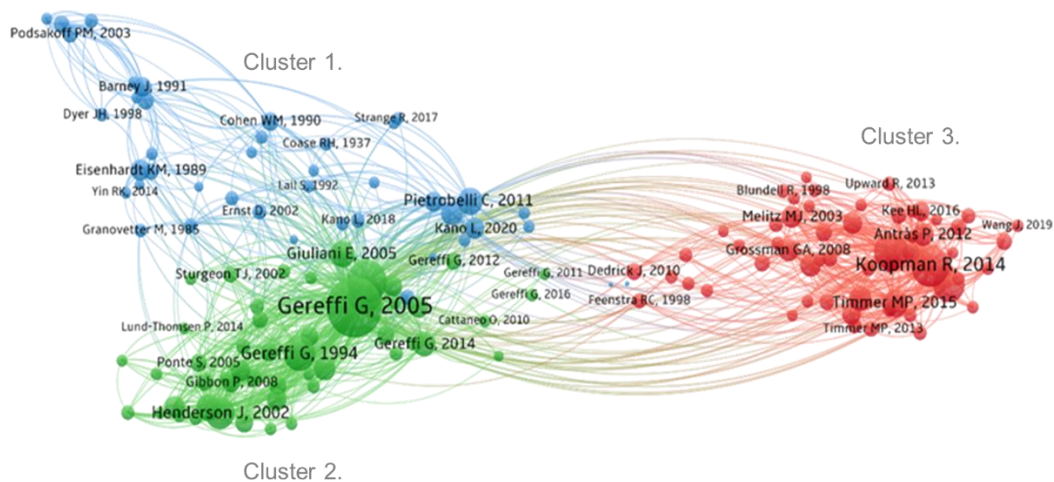
2.3.1. Intellectual structure

The intellectual structure reflects the knowledge base of a research field. A co-citation network reveals conceptual similarities between documents when they are cited together in other publications' reference lists (Aria & Cuccurullo, 2017). This network was constructed using citation data from our database, where each node represents a referenced work. To ensure interpretability, we focused on the top 150 most cited references, generating a 150×150 co-occurrence matrix that quantifies how often document pairs are co-cited. The unit of analysis was the cited reference. The resulting co-citation network (Figure 3) reveals three distinct clusters, each representing different but interrelated strands of GVC research. These clusters are color-coded for visual distinction: Cluster 1 (blue), Cluster 2 (green), and Cluster 3 (red).

The blue cluster represents a research strand that connects GVCs analysis with the evolutionary and institutional traditions of innovation studies. Foundational

works by Freeman (1987), Lundvall (1992), Nelson (1993), Dosi (1982), and Bell and Pavitt (1993) conceptualize innovation as an interactive, cumulative, and institutionally embedded process. These studies emphasize the role of learning, technological capabilities, and local knowledge systems in shaping competitiveness. Subsequent contributions, including Giuliani et al. (2005) and Pietrobelli and Rabellotti (2011), extend these ideas to the context of developing economies, examining how firms and clusters engage in upgrading through learning mechanisms and linkages with global lead firms.

Figure 3. Mapping the Co-Citation Network of Key Contributions to GVC Literature



Source: Authors' visualization based on WoS data using VOSviewer.

Cluster 2 emerges as the densest grouping in our network, containing many seminal works on GVCs governance and upgrading. Central to this cluster, Gereffi (1999) introduces the distinction between producer-driven and buyer-driven chains, linking firm governance structures to patterns of industrial organization and development outcomes. Humphrey and Schmitz (2002) advance this framework by conceptualizing different forms of governance and by analyzing how learning and upgrading processes determine the positions of developing-economy firms within global production systems. Gereffi, Humphrey, and Sturgeon (2005) further consolidate the field by formalizing the governance typology, which includes hierarchical, captive, relational, modular, and market forms, highlighting how technological capabilities and information complexity shape coordination mechanisms across value chains. Research within this cluster typically combines comparative sectoral case studies with multiscalar analytical approaches, drawing on political economy and economic geography to explain how global production is structured, controlled, and transformed through governance dynamics.

Finally, Cluster 3 shows the quantitatively oriented strand of GVC research, grounded in trade analysis and the measurement of production fragmentation. Hummels et al. (2001) introduce the concept of vertical specialization, capturing

the import content of exports and providing an early empirical foundation for understanding cross-border production linkages. Johnson and Noguera (2012) refine this approach by quantifying value-added trade patterns through international input–output analysis, while Koopman et al. (2014) develop a comprehensive accounting framework that decomposes gross exports into domestic and foreign value-added components, reshaping how interdependence in global production is measured. Studies in this cluster adopt formal trade models and input–output methodologies to study the structural fragmentation of production and the spatial distribution of value creation across economies, positioning this research stream firmly within the analytical tradition of international economics.

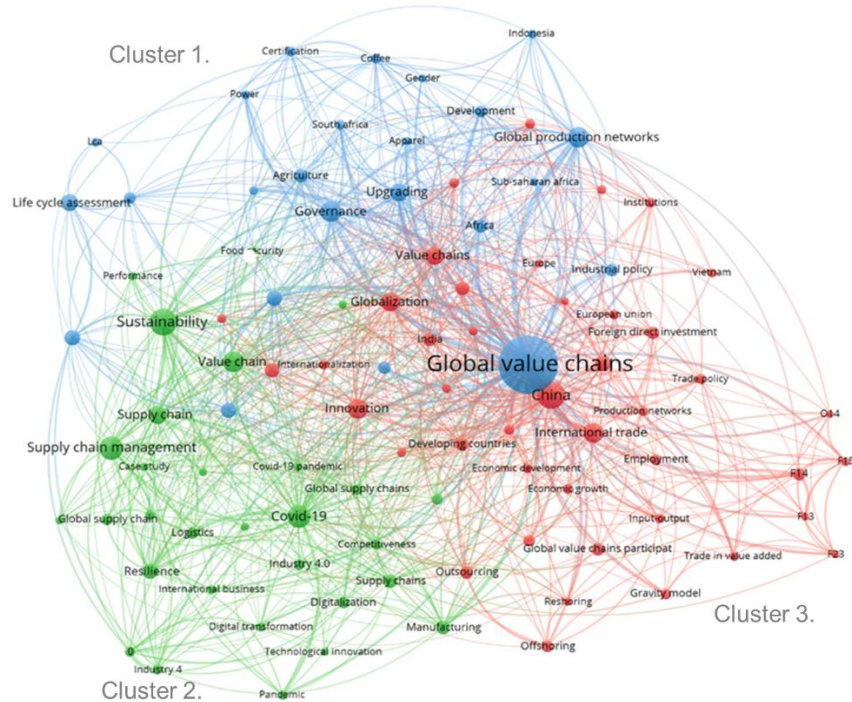
2.4. Conceptual structure

To map the conceptual structure of GVCs research, we constructed a co-occurrence network based on the 100 most frequent author keywords from our dataset. In this network visualization, each keyword is represented as a labeled node, with the node size corresponding to the term's frequency. As illustrated in Figure 4, the network reveals three distinct clusters, each denoted by a different color: Cluster 1 (blue), Cluster 2 (green), and Cluster 3 (red).

Cluster 1 is characterized by key terms such as “Global Value Chains (GVCs),” “Global Production Networks (GPNs),” “Governance and “Upgrading.” Although both the GVC and GPN approaches analyze the international division of labor and the fragmentation of production processes, their analytical emphases differ. GVC research focuses on the social relationships among firms, particularly dynamics of coordination, control, and power, whereas GPN research highlights the spatial and institutional interconnections linking firms to specific territories (Scholvin, 2020). The relevance of “Governance” and “Upgrading” reflects their central role in GVC scholarship, as they capture how power asymmetries and coordination mechanisms condition firms’ and regions’ capacity to move into higher value-added activities within global production systems.

Cluster 2 represents a dynamic research front that connects traditional supply chain studies with the contemporary challenges of global production. It brings together keywords such as “Supply Chain Management,” “Global Supply Chains,” “Sustainability,” “Covid-19,” “Industry 4.0,” and “Technological Innovation.” The terms reveal a shift toward understanding how GVCs respond to environmental and technological transformations as well as to global disruptions. Research in this cluster explores how firms and territories adapt their supply and production systems to achieve greater sustainability, resilience, and digital integration. Themes such as sustainable development, circular economy, and performance assessment reflect growing attention to the territorial and environmental implications of GVCs. At the same time, the presence of “Covid-19” and “Digital Transformation” underscores the interest in the vulnerabilities and restructuring of supply chains under crisis and technological change.

Figure 4. Co-Occurrence Network of Author Keywords in GVCs Research



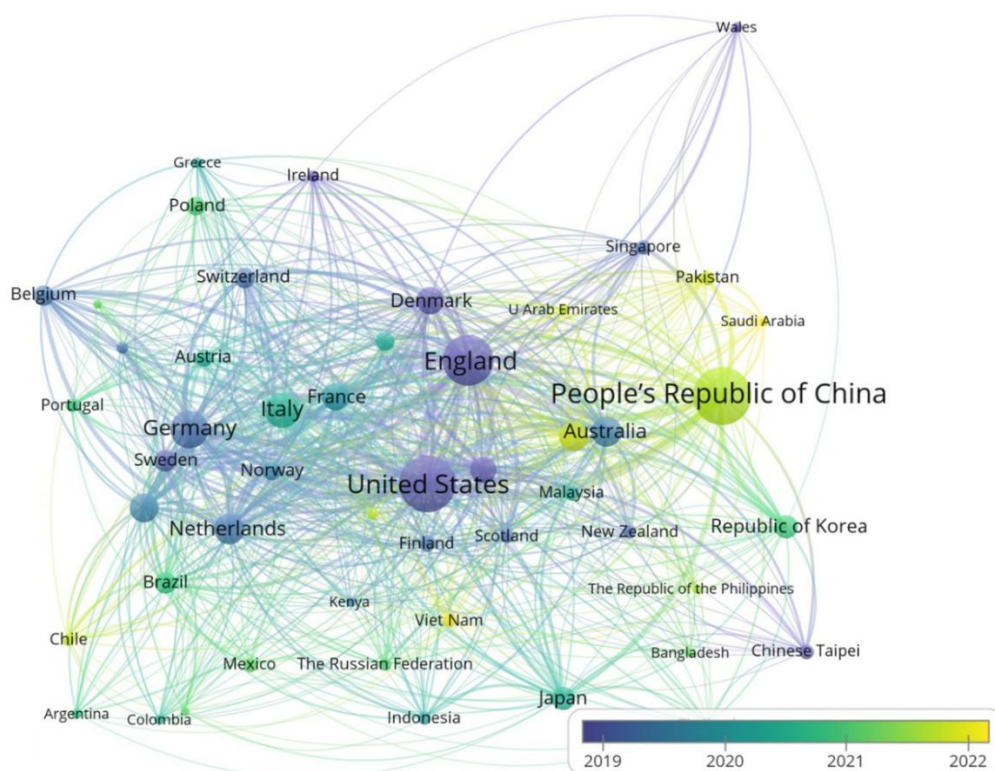
Source: Authors' visualization based on WoS data using VOSviewer Software.

Finally, we can observe in Cluster 3 a concentration of studies that approach GVCs from a trade-oriented and macroeconomic perspective. This cluster is centered on keywords such as “China,” “International Trade,” “Foreign Direct Investment (FDI),” “Value Added,” “Offshoring,” and “Reshoring.” The prominence of China reflects its pivotal role as a global production and export hub, while the presence of terms related to trade and investment indicates a strong link to international economics. Research within this cluster focuses on quantifying global production interdependencies through analytical tools such as gravity models and multi-economy input–output analyses. These approaches are used to examine how trade, investment, and production fragmentation shape the structure and dynamics of GVCs. In this sense, Cluster 3 represents the empirical and data-driven core of GVC scholarship, complementing the governance and sustainability orientations of Clusters 1 and 2.

2.4.1. Social structure

In this section, we analyze academic networks as a tool to understand how relationships and interactions among researchers are structured. These networks make it possible to observe different forms of intellectual collaboration, including professional communication and joint projects to co-authorship and academic debate (White, 2011). We use them as an analytical tool to map research linkages among scholars, institutions, and economies (Aria & Cuccurullo, 2017). Based on this approach, we build a region-level collaboration network (Figure 5) to identify patterns of joint research production and study the contributions of APEC member economies to the GVCs literature. Our analysis focuses on the fifty most productive economies in terms of publication output.

Figure 5. Collaboration Network in GVC Research Among the Top 50 Publishing Economies



Source: Authors' visualization based on WoS data using VOSviewer Software.

According to this figure, we can observe that research collaboration on GVCs is highly internationalized, with dense connections among scholars from North America, Europe, and Asia. China; England; and the United States appear as the main hubs of the global collaboration network, showing a high degree of connectivity with both developed and emerging economies. The color gradient, which represents the average publication year, reveals clear temporal patterns. While the United States and England display long-standing research activity, China's collaborations are more recent and have expanded rapidly since 2020. We can also see strong research ties between China and key APEC economies such as Australia; Japan; Korea; and the Philippines, pointing to an increasing regionalization of GVC research within Asia and Oceania. At the same time, European economies like Germany; Italy; the Netherlands; and Spain appear in intermediate positions within the collaboration network. Their nodes are closely connected to those of Argentina; Brazil; Chile; Colombia; Mexico; and the United States, indicating relatively frequent co-authorship links with researchers from the Americas. By contrast, their connections with Asian economies are less pronounced.

2.4.2. Main findings of the bibliometric analysis results

In our analysis, we identify clear links between the intellectual, conceptual, and social dimensions of GVCs research. The intellectual structure shows that the field has developed around three complementary traditions: (1) qualitative work on governance, power, and innovation dynamics; (2) research connecting supply

chain management with sustainability and technological transformation; and (3) quantitative studies examining trade fragmentation and value-added measurement. These clusters reflect a diverse but coherent research field where qualitative and quantitative approaches inform each other. The conceptual structure confirms this diversity. Traditional supply chain perspectives remain central, but they increasingly intersect with topics such as Industry 4.0, digital transformation, and technological upgrading, reflecting a gradual shift toward understanding how production networks adapt to new technological and environmental challenges.

The social structure offers a complementary view. Collaboration patterns show that researchers based in China and the United States occupy central positions, reflecting both their research capacity and the empirical relevance of these economies within GVCs studies. Regional links are also evident: collaborations among Asia-Pacific economies are dense, while Europe maintains strong connections with North and South America.

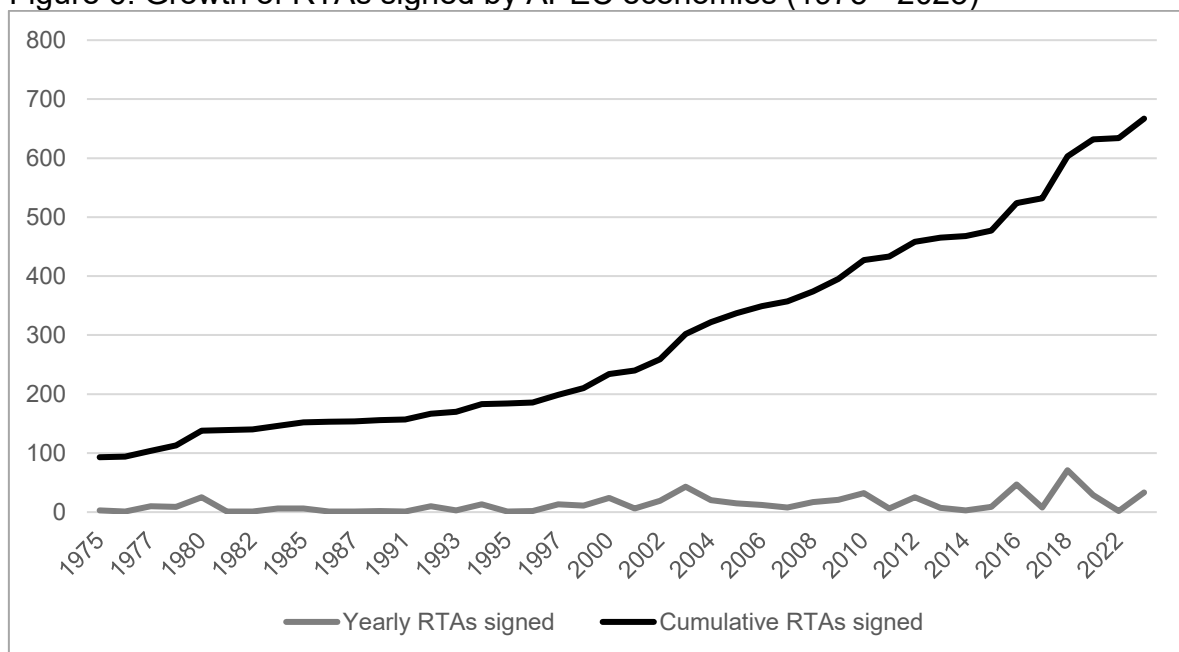
In our analysis, we find that GVC research has evolved into a multidimensional field in which theoretical perspectives, methodological approaches, and collaboration networks advance in constant interaction. We see this diversity not as a limitation but as a sign of the field's capacity to adapt to new analytical challenges and global transformations. Future studies, in our view, should continue to examine how the growing participation of scholars from emerging economies reshapes conceptual priorities, and how the dialogue between qualitative and quantitative approaches can open new ways of understanding the dynamics of global production.

2.5. Trade Agreements and Economic Integration in the APEC Region

Worldwide, Regional Trade Agreements (RTAs) among economies have been significantly growing since the 1990s, a trend closely associated with the expansion of international production networks (Zhang et al., 2021). As key nodes in GVCs, APEC economies have been particularly active in establishing RTAs, both intra-regionally and with external partners. Figure 6 illustrates the cumulative and annual count of RTAs signed by APEC members from 1975 to 2023, revealing a notable acceleration in agreement formation beginning in the late 1990s. This institutional development has fostered more robust GVC integration among participating economies by systematically reducing both tariff and non-tariff barriers affecting trade in raw materials, intermediate goods, and final products.

To analyze this shift in greater detail, we mapped the network of Regional Trade Agreements (RTAs) exclusively among APEC economies in 1995 and 2020 using NodeXL to construct comparative network maps. In these visualizations, nodes represent APEC member economies engaged in intra-regional RTAs, while edges indicate bilateral agreements between them, with node size reflecting the number of agreements per economy and color-coding identifying clusters of economies sharing common attributes.

Figure 6. Growth of RTAs signed by APEC economies (1975 - 2023)¹

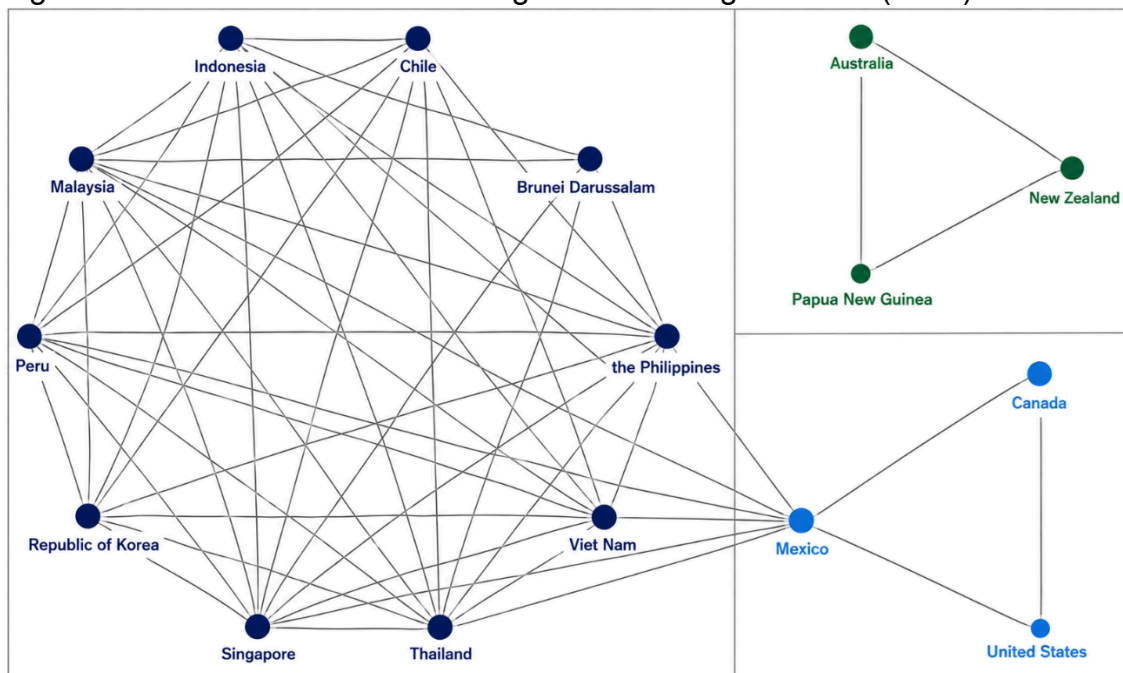


Source: own elaboration with data of Desta (Dür et al., 2025)

We can observe in Figure 7 the network of Regional Trade Agreements (RTAs) in 1995. The network consists of 16 nodes, each representing an APEC member economy that had signed at least one intra-APEC RTA by that year. Five APEC members: China; Hong Kong, China; Japan; The Russian Federation; and, Chinese Taipei are not included in the network, as they had not entered any intra-APEC RTAs up to that point. The network includes a total of 56 edges, each indicating the existence of at least one bilateral RTA between the connected economies. The network shows that Indonesia; Malaysia; the Philippines; Singapore; and Thailand were the most connected economies in 1995, each maintaining ten bilateral links, which indicates their strong participation in regional trade cooperation. In contrast, Australia; Canada; New Zealand; Papua New Guinea; and the United States are the least connected, each with only two linkages.

¹ Global System of Trade Preferences among Developing Countries (GSTP) was signed in 1988, and some of the APEC economies are signatories of this agreement, but this year is not included in the figure.

Figure 7. Network of Intra-APEC Regional Trade Agreements (1995)

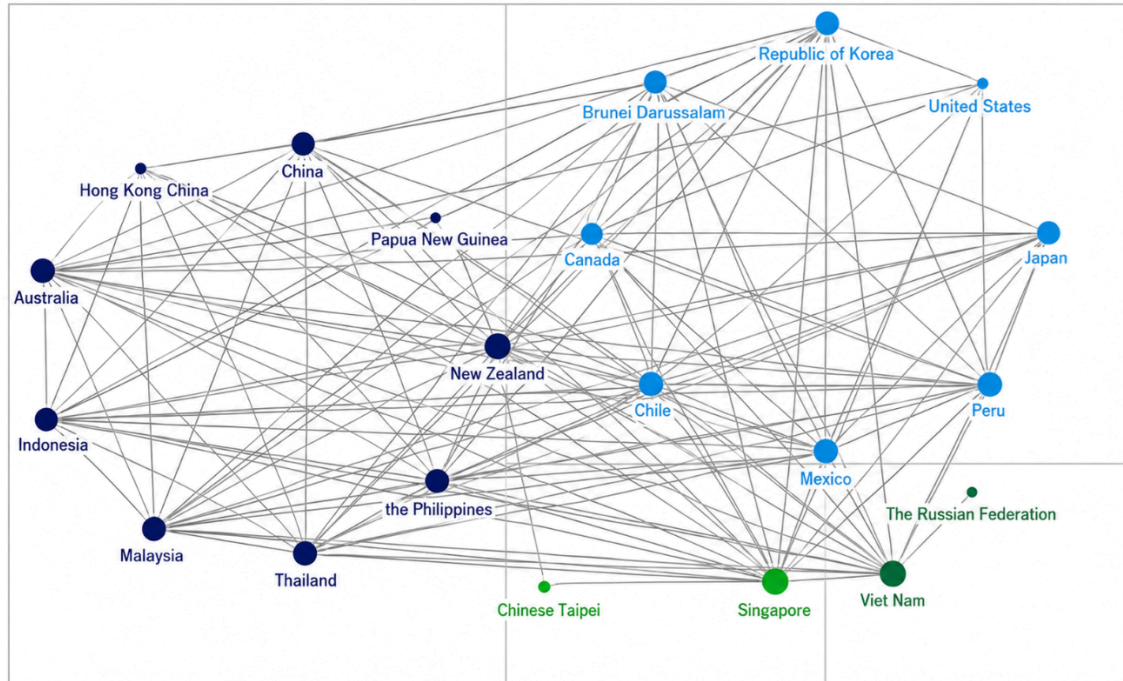


Source: Author's elaboration using NodeXL, based on data from Desta (Dür et al., 2025).

The network visualization also reveals the formation of three distinct clusters, each reflecting specific patterns of regional integration. Geographic proximity appears as a key factor shaping RTA formation among APEC economies, consistent with classical trade theory that identifies distance as a major determinant of bilateral trade flows. Cluster 1 (dark purple) represents the most densely interconnected group, comprising East Asian economies along with Chile and Peru from South America. Cluster 2 (green) consists of Oceania's core economies, Australia; New Zealand; and Papua New Guinea, which, despite being founding APEC members, had not established RTAs with other member economies during this period. Finally, Cluster 3 aligns with the original NAFTA membership (Canada; Mexico; and the United States), though only Mexico had additional RTAs with other APEC partners, reflecting a more diversified trade agreement strategy.

Figure 8, on the other hand, shows the network of RTAs of APEC economies for 2020. This graph shows the 21 APEC economies in a much more complex and interconnected network. In total, there are 135 links between the different nodes, with New Zealand and Singapore being the most connected in the network with 18, and Australia; Chile; and Viet Nam with 17 agreements. In contrast, The Russian Federation is the least connected economy, with only one RTA with Viet Nam, followed by Papua New Guinea and Chinese Taipei, with only two RTAs. Notably, Papua New Guinea's level of integration has remained unchanged throughout the entire period analyzed.

Figure 8. Network of Intra-APEC Regional Trade Agreements (2020)



Source: Author's elaboration using NodeXL, based on data from Desta (Dür et al., 2025).

Additionally, through this figure we can observe four clusters of markedly different sizes, two large groupings and two smaller ones. Compared with the 1995 configuration, the network shows a substantial reorganization, with Asian economies now distributed unevenly across all four clusters. The new Cluster 1 (dark blue) combines selected Asian economies with all three Oceania members, incorporating major new participants like China and Hong Kong, China. Cluster 2 (light blue) forms a trans-Pacific grouping that integrates all American economies (e.g., Canada; Chile; Mexico; Peru; and the United States) with Northeast Asian partners (Brunei Darussalam; Japan; and Korea). The two smaller clusters reveal distinctive patterns of connectivity. Cluster 3 (light green) links Singapore, one of the most connected economies in the network, with Chinese Taipei, which remains comparatively less integrated. Cluster 4 (dark green) connects The Russian Federation with Viet Nam, reflecting another case of uneven connectivity between highly and weakly integrated members.

The structural evolution between the two years reveals several significant findings that challenge traditional explanations of RTA formation. Most notably, the observed cluster reconfiguration demonstrates a marked decline in geographic determinism, suggesting the growing importance of alternative factors in shaping trade agreements. Social network theory provides relevant conceptual tools for understanding this shift, particularly through mechanisms like transitivity and homophily (Lee & Bai, 2013), where actor attributes and existing relationships influence network formation. However, in the APEC context, participation in GVCs emerges as a particularly crucial factor - evidenced by the central positioning of China and the United States (two GVC hubs) in separate major clusters. This distribution warrants deeper investigation into how GVC

integration shapes RTA networks. The network expansion also highlights divergent trajectories among newer participants: while China; Hong Kong, China; and Japan (a founding member) have achieved central positions, The Russian Federation and Chinese Taipei remain peripheral, suggesting varying levels of economic integration among APEC members and the influence of non-economic factors (e.g., politics or institutionals) shaping RTA networks.

2.6. Input-Output Analysis and TiVA Indicators in the APEC Region

This section uses data from the *OECD Inter-Country Input-Output (ICIO) tables* and Trade in Value Added (TiVA) indicators. The goal is to describe how APEC economies are linked through trade and production. These tools help separate exports into two parts: value created within the economy and value created abroad (OECD, 2021; Timmer et al., 2014).

The analysis focuses on 20 APEC economies. It compares how each member economy uses imported inputs and how much value they add before exporting. This gives a clearer picture of how each economy is positioned in GVCs within the region (López González, 2016; Los et al., 2015).

2.6.1. Data and Method

In this analysis, we use the most recent version of the *OECD Inter-Country Input-Output* (OECD ICIO, 2021) tables, which provide harmonized and internationally comparable data for 76 economies and 45 economic activities, classified according to the International Standard Industrial Classification. These tables allow us to trace the flow of goods and services across economies and industries, capturing both domestic transactions and cross-border linkages within global production networks. For the purposes of our analysis, we extract a submatrix from the latest available database, selecting only the APEC member economies. Each APEC member economy is treated as a distinct region, enabling us to construct an inter-region input-output table that reflects production and trade linkages exclusively within the APEC region.

A key limitation of our analysis is that, due to data constraints, it was not possible to include Papua New Guinea. The OECD ICIO database does not provide individual data for this economy, which makes it unfeasible to incorporate it into the input-output framework with the required level of sectoral and region-level detail. To ensure consistency and comparability across all regions analyzed, our sample is therefore limited to the 20 APEC economies for which such data is available. To analyze trade and production linkages within the APEC region while preserving the broader structure of global interdependencies, we construct a customized regional aggregation consisting of three components. In this regard:

- (i) We treat each of the 20 APEC economies as a distinct region, which allows us to explore intra-APEC relationships at the region level.

- (ii) We retain the predefined regional aggregates included in the original ICIO tables (e.g., "Rest of the World") to maintain consistency with the structure of the source data and to capture external linkages that remain relevant to the analysis.
- (iii) We create a new aggregate group labeled "Non-APEC" by combining all non-APEC economies that appear individually in the original ICIO dataset. This step allows us to clearly separate APEC economies from other global actors, while preserving the distinction between explicitly reported economies and aggregated regions.

The resulting input-output matrix includes 22 economies, comprising 20 APEC member economies, one OECD-defined aggregate, and one custom-defined "Non-APEC" group. Each economy comprises 45 sectors, yielding a 990×990 matrix that captures intermediate and final demand flows across economies and industries. Table 3 summarizes the composition of this matrix, including the regional distribution and sectoral classification used in the analysis.

Table 3. Structure of the Customized APEC region Input-Output Matrix

Structure of the OECD ICIO Table for APEC Economies		Intermediate use at basic prices	Final Demand	Output at basic prices
		Econ. 1 x indy 1 [...] Econ. 22 x indy 45	Economy 1 [...] Economy 20	
Economy 1 ... Industry 45 Industry 1 ... Industry 45 Industry 1 ... Industry 45 Economy 22	Industry 1 ... Industry 45 Industry 1 ... Industry 45 Industry 1 ... Industry 45	(Z) Intermediate use at basic prices matrix (990 x 990)	(FD) Total final demand	(X)
Taxes less subsidies on intermediate and final products	paid by Economy 1 [...] paid by Economy 20	(TLS) Taxes less subsidies on intermediate and final products (20 economies x 990 industries)	[TLS]	
Value added at basic prices		(VA) Value added at basic prices (1 row x 990 industries)		
Output at basic prices		(X) Output at basic prices		

Source: Author's own elaboration based on the OECD ICIO Database (OECD, 2021). Available at: <http://oe.cd/icio>

The methodological steps were as follows:

2.6.1.1. Leontief inverse matrix ($L = (I - A)^{-1}$):

The Leontief inverse matrix, also known as the output multipliers matrix, captures the total (direct and indirect) input requirements of a given economy-industry (c, i) from all other economy-industries (p, h) in the system, per unit of final demand.

In our analysis, we use the Leontief inverse matrices provided by the OECD ICIO database (OECD, 2021), which offer harmonized data for 45 industries across all included economies. Specifically, we access the 45×45 Leontief inverse matrix for each of the 20 APEC member economies individually. These matrices form the basis for estimating average **total backward linkages**, which reflect the extent to which each industry relies on upstream inputs, both domestic and foreign, within the global production structure. By averaging across rows of the Leontief inverse, we obtain an indicator of the upstream embeddedness of each industry, thereby identifying sectors with stronger or weaker dependence on global input chains.

2.6.1.2. Average normalized total Backward linkages:

These indicators reflect the extent to which the production of each sector depends on inputs, both direct and indirect, from other industries (Miller and Blair, 2009). The total backward linkage for each industry ($BL(t)_j$) is estimated as the sum of $i = 1 \dots n$ rows keeping fix each j column of Leontief matrix as follow:

$$BL(t)_j = \sum_{i=1}^n l_{ij}$$

Where l_{ij} is the requirement of industry j from industry i to achieve one unit of production. In other words, the element i, j of Leontief coefficient matrix. Following Rasmussen (1957), we estimate the normalized measure of $BL(t)_j$ for each APEC economy as follow:

$$\overline{BL}(t)_j = \frac{n \times BL(t)_j}{\sum_{i=1}^n \sum_{j=1}^n l_{ij}}$$

Finally, we averaged the $\overline{BL}(t)_j$ of 20 APEC economies such that we have 45 average normalized total backward linkages.

2.6.1.3. Average normalized total Forward linkages:

This measures the extent to which each industry provides inputs to other industries that used them in the production. The indicator is obtained for each row i by summing the $j = 1 \dots n$ columns of the Ghosh inverse matrix (G)

$$FL(t)_i = \sum_{j=1}^n g_{ij}$$

Where g_{ij} is the sale of input form industry i to other $j=1 \dots n$ industries to achieve one unit of output. This is equivalent to the element i, j of Ghosh coefficient matrix. For normalization of $FL(t)_i$, for each APEC economy we follow similar normalization process applied to backward linkages as follow:

$$\overline{FL}(t)_i = \frac{n \times FL(t)_i}{\sum_{i=1}^n \sum_{j=1}^n g_{ij}}$$

Finally, we averaged the $\overline{FL}(t)_j$ of 20 APEC economies such that we have 45 average normalized total forward linkages.

2.6.1.4. Classification of Backward (BL) and Forward Linkages (FL):

The normalized BL and FL allow us to identify key sectors in the economy. In this sense, sectors with simultaneously high (greater than 1) BL and FL reveal a key sector because they have strong linkages both in selling inputs to other sectors and in demanding inputs from them. A helpful device to classify sectors according to their linkages is the four-quadrant graph, shown in Table 4, where quadrant I identifies sectors with weak linkages in the economy, quadrant II includes sectors dependent on interindustry demand, quadrant III locates key sectors with both strong forward and backward linkages, and quadrant IV includes sectors highly dependent on interindustry supply (Miller & Blair, 2009).

Table 4. Classification of backward and forward linkages

		Direct or Total Forward Linkage	
		Low (<1)	High (>1)
Direct or Total Backward Linkage	Low (<1)	(I) Generally independent	(II) Dependent on interindustry demand
	High (>1)	(IV) Dependent on interindustry supply	(III) Generally dependent

Source: Miller and Blair (2009)

2.6.1.5. Trade in Value Added indicators (TiVA)

All indicators of value added used in this analysis are derived from the OECD's Trade in Value Added (TiVA) database, based on the OECD ICIO Tables, 2021 edition. This dataset provides harmonized, internationally comparable statistics that trace the value added by each economy and industry in the production of goods and services that are traded across borders. TiVA indicators allow for a better understanding of the role economies play in GVCs, by identifying where value is created, rather than just where goods are shipped. For this analysis, we use TiVA metrics to analyze the (i) domestic value added in foreign final demand; (ii) origin of value added in final demand; (iii) origin of value added in gross imports; and (iv) origin of value added in gross exports. Each of these indicators is described in more detail below.

- **Domestic value added in foreign final demand**

For each industry i in economy c , the domestic value added embodied in final demand is reported by OECD (2021) as the share of total final demand in industry i at economy c as follow:

$$valu_ffddva_{c,i} = \frac{\sum_p ffddva_{c,i,p}}{valu_{c,i}} * 100$$

We averaged the share of value added in final demand for all APEC economies for each industry, such that we arrive at 45 average industry value added share for year 1995 and 2020 as follow:

$$Avg_valu_ffddva_i = \frac{1}{20} \sum_{c=1}^{20} valu_{c,i} * 100$$

This indicator shows the proportion of value added in final demand at each industry of the whole APEC economies.

Whit the value added embodied in final demand we also estimate the proportion of value added by sector s in each APEC economy c . To do so, we classify the 45 industries in Primary, Manufacturing and Services sectors as shown in the table 5 below². The estimation uses the following equation, where n_s is the number of industries that composes each sector s .

$$valu_ffddva_{c,s} = \frac{1}{n_s} \sum \frac{valu_ffddva_{c,i}}{valu_ffddva_c} * 100$$

- **Origin of value added in final demand (FDVA_BSCI)**

The value added embodied in final demand for each economy-sector is obtained from OECD (2021). In nomenclature of TiVA manual, this indicator is named as FDVA_BSCI and represents the amount of value added embodied in final demand for an economy-industry generated as accumulation of value added generated in the productive process of several economies-industries sources. According to OECD (2021), the indicator is estimated as follow:

$$FDVA_BSCI_{c,i,p,h} = (\hat{V}BFD_{p,h})_{c,i}$$

Where the $(\hat{V}BFD_{p,h})_{c,i}$ is the value added in final demand of industry h in economy p where the source of value added is the industry i of economy c . We used this indicator to estimate the share of value added embodied in final demand for each industry in each origin source as follow:

$$FDVA_BSCI_{c,i,p,h} = \frac{\sum_{i=1}^{45} (FDVA_BSCI_{c,i,p,h})}{FDVA_BSCI_{c,i,p,h}} * 100$$

The source of value added in final demand is estimated for each industry within each APEC economy, APEC block, the world and between combinations of them.

² For further details, a more comprehensive table listing the 45 industries and their classification into the three broad sectors is provided in Appendix A.

Table 5. Classification of economic sectors in value added activities.

Value-Adding Activity	Industry Code	Industry Aggregate
Primary	A	Agriculture, hunting, forestry, and fishing
	B	Mining and quarrying
Manufacturing	C	Total manufacturing
	D	Electricity, gas, steam and air conditioning supply
	E	Water supply; sewerage, waste management and remediation activities
	F	Construction
	G	Wholesale and retail trade; repair of motor vehicles and motorcycles
	H	Transportation and storage
Services	I	Accommodation and food service activities
	J	Information and communication
	K	Financial and insurance activities
	L	Real estate activities
	M	Professional, scientific and technical activities
	N	Administrative and support service activities
	O	Public administration and defense; compulsory social security
	P	Education
	Q	Human health and social work activities
	R	Arts, entertainment and recreation
	S	Other service activities
	T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
Total activities	T	Total - all activities

Source: Author's elaboration based on OECD (2021).

- **Origin of value added in gross imports (IMGR_BSCI)**

The value added embodied in gross imports is captured by the TiVA indicator labeled IMGR_BSCI. This variable identifies the origin of the value added contained in the imports of a given economy c , specifying both the source economy s and the originating industry (p, i) . In other words, it traces how much value added from each foreign economy-industry is embedded in the goods and services imported by economy c .

$$IMGR_BSCI_{p,c,i,s} = \hat{V}B \ IMGR_{p,c}$$

This indicator is filtered such that we have how value added are embodied in gross imports of each APEC member economy, where the source of imports is the APEC region, non-APEC economies and the entire world.

- **Origin of value added in gross exports (EXGR_BSCI)**

The origin of value added embodied in gross exports let us know how of the exports are value added splitting by economy-industry source. This indicator is estimated as follow, where $(\hat{V}B \ EXGR_{c,i})_{p,h}$ is the value added embodied in exports intermediate inputs and final goods and services from economy-sector p and industry h to industry i of economy c .

$$EXGR_BSCI_{p,h,c,i} = (\hat{V}B \ EXGR_{c,i})_{p,h}$$

Using this indicator, we can assess how value of exports is value added generated in each APEC economy-industry and exported to APEC region, non-APEC region and the entire world.

2.6.2. Empirical Analysis

2.6.2.1. Forward and Backward Linkages

Mapping the structure of economic interdependencies over time provides key insights into the evolving role of different sectors in regional production systems. Figures 10 and 10 present the forward and backward linkages for 45 industries across 20 APEC economies in 1995 and 2020, respectively. The graphs divide industries into four quadrants: Key Strategic Sectors (high forward and backward linkages), Downstream-Driven Sectors (high backward, low forward), Upstream Suppliers (high forward, low backward), and Weakly Integrated Sectors (low in both dimensions).

Overall, the structure appears relatively stable across both periods. However, several relevant shifts and patterns emerge:

- **Persistent Structural Patterns:**

Across both periods, the distribution of industries remains broadly stable. Most industries cluster in the weakly integrated quadrant, suggesting limited participation in indirect production chains. This aligns with findings in the literature emphasizing that many services and public sectors tend to exhibit limited intermediate interactions (Los et al., 2016; Timmer et al., 2014).

In contrast, sectors such as Financial and insurance activities (K), Professional, scientific and technical services (M), and Chemicals (C20) consistently appear in the key strategic quadrant. Their dual role as significant buyers and suppliers of inputs positions them as central hubs in the production network, what Timmer et al. (2013) describe as “high-impact sectors” within GVCs. These sectors tend to have higher technological content and knowledge spillovers, increasing their potential to drive upgrading in the economy (Gereffi et al., 2005; Hausmann et al., 2007).

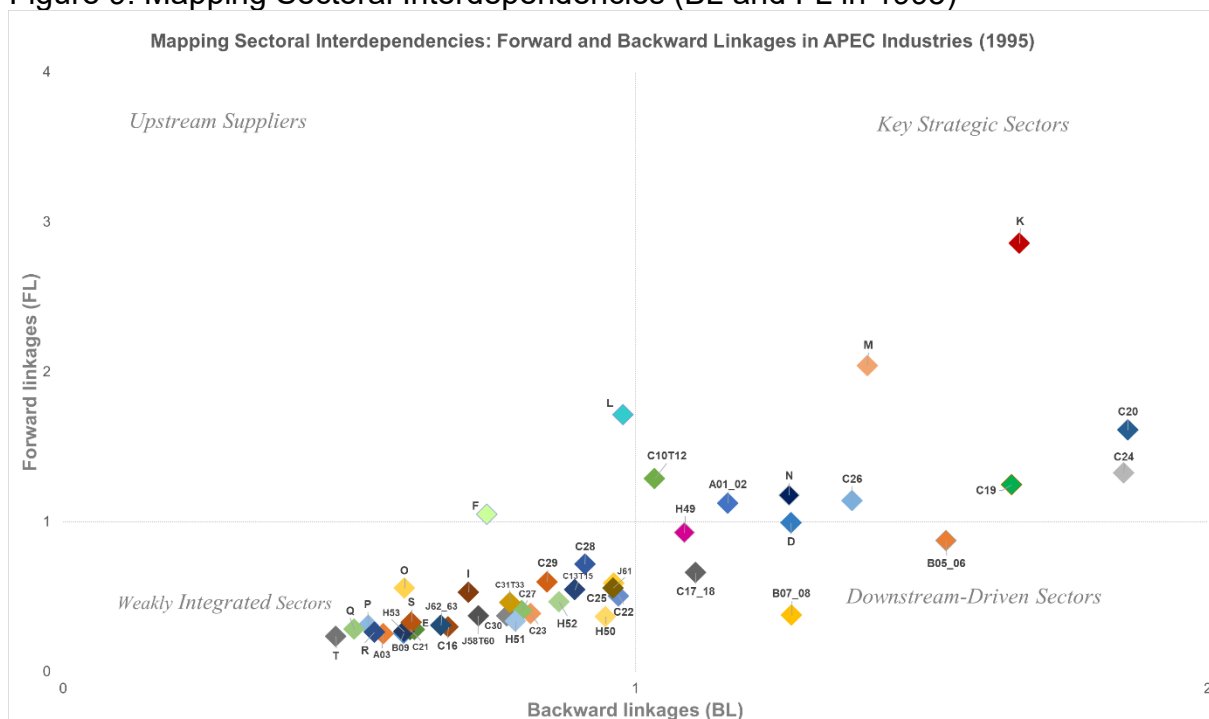
- **Sector G as an Outlier:**

A notable outlier is the *wholesale and retail trade; repair of motor vehicles and motorcycles* (G), which displays exceptionally high linkage values: a forward linkage exceeding 13 and a backward linkage slightly above 3 in both years. Although not visible in the graphs due to scaling limits, this sector’s role as an intermediary for virtually all goods places it at the center of the distribution network. This extreme centrality, while typical for trade and intermediation sectors, highlights the challenge noted by Amador and Cabral (2016): sectors with high input-output flows are not necessarily the most value-generating, yet they are indispensable for the operation of global and regional value chains.

– Gradual Sectoral Repositioning:

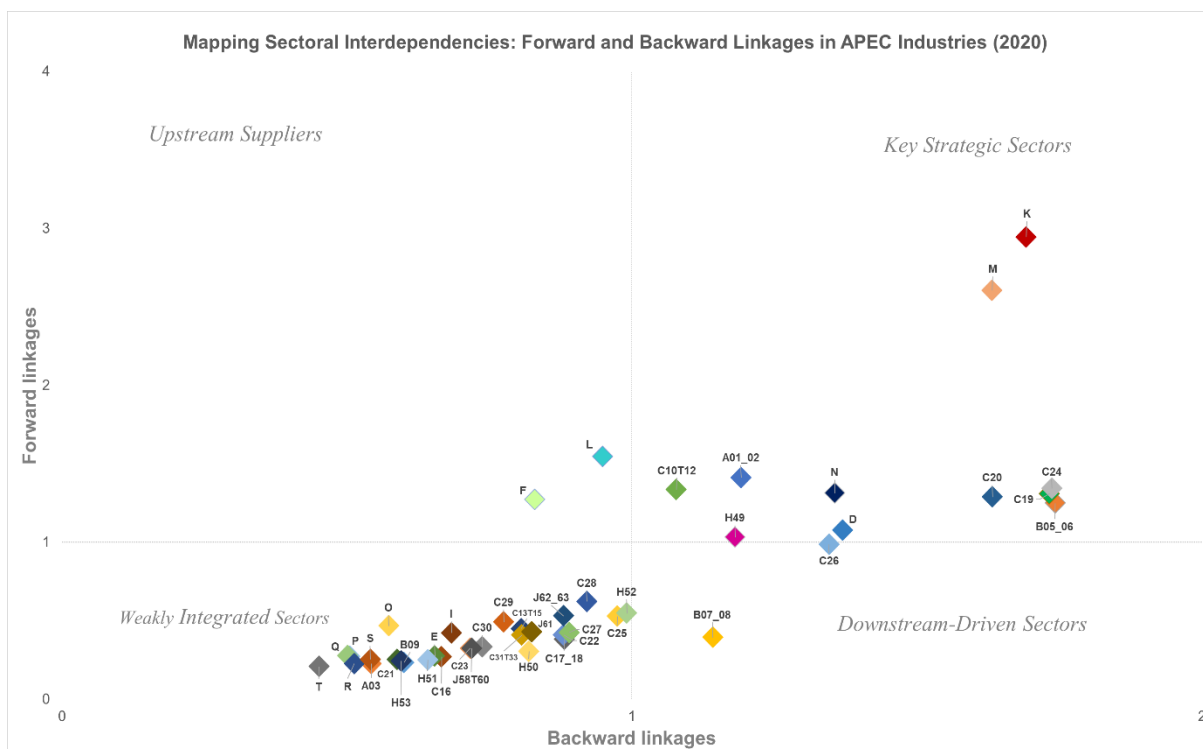
While the overall structure of inter-industry linkages remains relatively stable, there is modest but meaningful evidence of sectoral repositioning over time. For example, Basic metals (C24) and Rubber and plastics (C22) exhibit a slight increase in their forward linkages between 1995 and 2020, suggesting an expanding role as suppliers of intermediate inputs to downstream industries. This trend is consistent with Andreoni and Chang (2016), who emphasize that mid-tech manufacturing sectors often increase their embeddedness in production networks as economies strengthen their industrial capabilities.

Figure 9. Mapping Sectoral Interdependencies (BL and FL in 1995)



Source: Authors

Figure 10. Mapping Sectoral Interdependencies (BL and FL in 2020)



Source: Authors

A particularly relevant pattern emerges in the 2020 mapping: Basic metals (C24), Chemical products (C20), Coke and refined petroleum (C19), and Mining of energy products (B05_06) appear spatially clustered in the downstream-driven quadrant, suggesting a grouping of resource-based and energy-intensive sectors characterized by relatively high backward linkages and moderate forward linkages. This configuration may reflect deeper integration of extractive and processing industries into broader value chains, where they act as key consumers of intermediate goods while supplying inputs to a more limited range of industries. These dynamics are consistent with findings from the literature on resource-based industrialization (Kaplinsky & Morris, 2016), which underscores the potential for upstream sectors to expand their role in the economy through technological upgrading and stronger linkages with related manufacturing activities.

– Persistent Asymmetries in Sectoral Roles

Certain sectors continue to exhibit pronounced asymmetries in their input-output relationships. In particular, Construction (F) and Real estate activities (L) remain located in the upstream quadrant, marked by relatively low backward linkages but forward linkages above 1. This positioning suggests that these sectors play a key role as providers of outputs to a wide array of downstream activities, including infrastructure, housing, and commercial development, while maintaining a comparatively low dependence on intermediate inputs. As noted by Del Prete et al. (2017), these sectors are structurally foundational to economic development, yet their limited integration into supply chains reflects the inherent characteristics of their production processes, which are often capital-intensive, site-specific, and less modular.

Their influence lies more in enabling other sectors than in stimulating complex inter-industry flows.

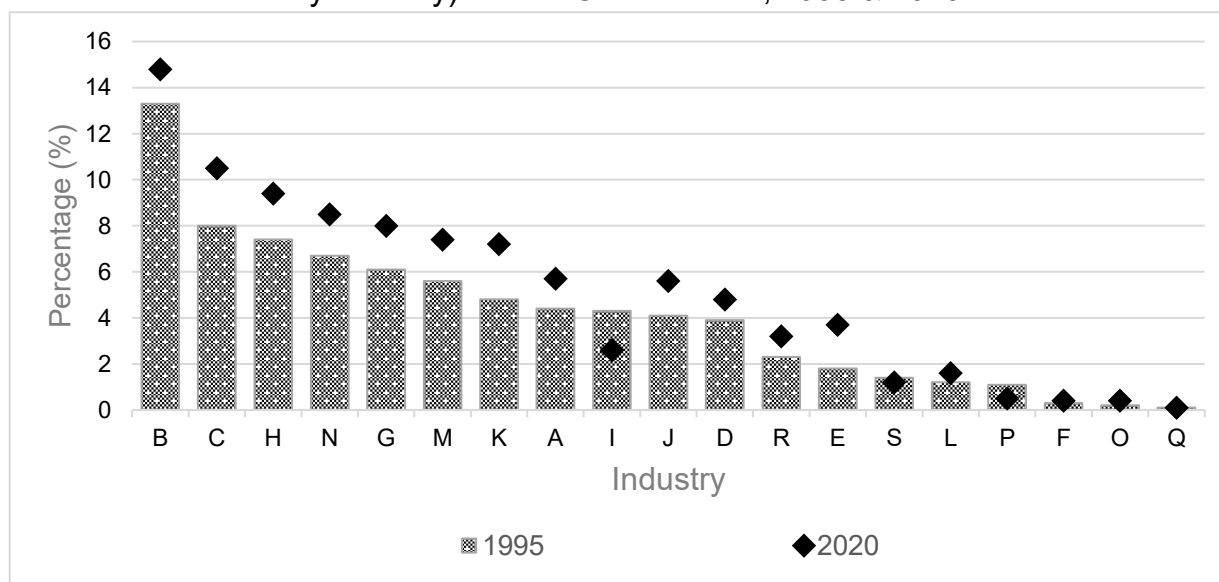
– Structural Inertia Among Peripheral Sectors

Lastly, industries such as Public administration (O), Human health and social work activities (Q), and Education (P) remain persistently located in the weakly integrated quadrant. These sectors continue to show low forward and backward linkages, reinforcing their peripheral position in terms of inter-industry flows. This structural inertia is consistent with observations from Timmer et al. (2014), who emphasize that public and non-market service sectors, despite being critical for welfare and human capital formation, tend to operate outside of the core input-output structure of production networks. Their limited connectivity should not be misinterpreted as inefficiency, but rather as a reflection of their institutional and functional role in the economy.

2.6.2.2. Trade in Value Added indicators (TiVA)

Figure 11 presents the average share of domestic value added (DVA) embodied in foreign final demand as a percentage of the total value added generated by each industry, across APEC economies in 1995 and 2020. This indicator captures the degree to which domestic production in each sector is embedded in international consumption, offering a complementary perspective to traditional gross trade statistics.

Figure 11. Domestic Value Added Embodied in Foreign Final Demand (% of Total Value Added by Industry) — APEC Economies, 1995 & 2020



Source: Authors

Several key patterns emerge:

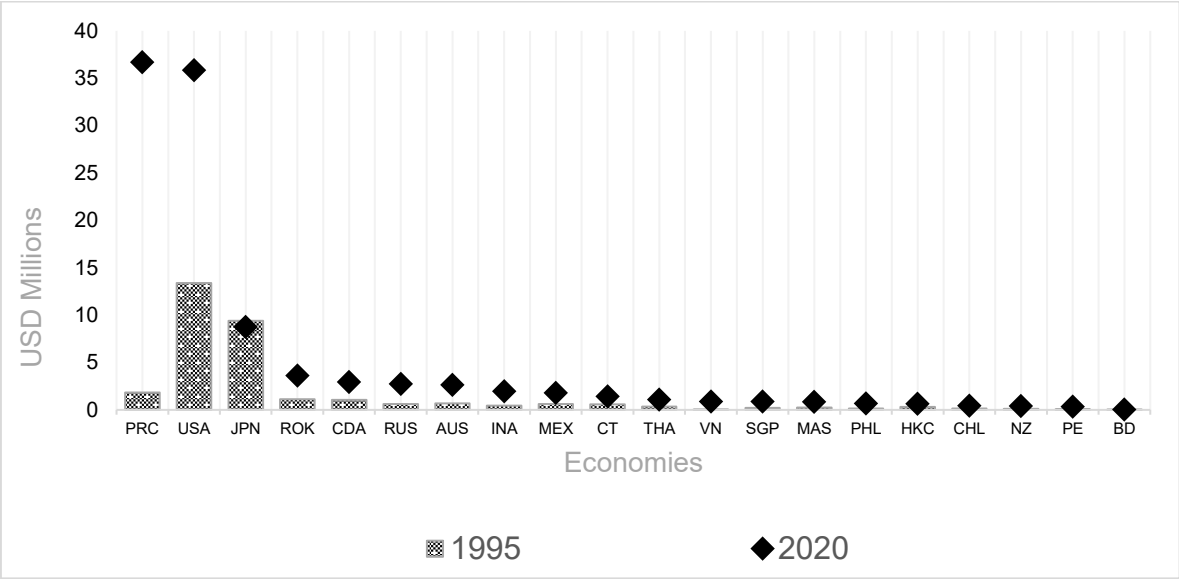
- Resource-based sectors remain dominant exporters of value added. The Mining and quarrying (B) sector consistently shows the highest share of DVA embodied in foreign final demand, accounting for over 13% of total value added in 1995 and increasing to nearly 15% by 2020. This trend underscores

the persistent reliance of APEC economies on extractive industries as primary contributors to global production chains.

- Industries such as Manufacturing (C) and, in particular, Chemical products (C20) maintain some of the highest shares of domestic value added embodied in foreign final demand. This pattern highlights the continued relevance of APEC economies within global manufacturing networks and reflects the strong integration of these sectors into international production systems. As noted by Timmer et al. (2014) and Baldwin (2016), manufacturing activities, especially those linked to medium- and high-technology industries, tend to be deeply embedded in GVCs, where they act as both significant importers of intermediate inputs and exporters of processed goods. The chemical industry, in particular, is characterized by complex, multi-stage production processes and a high degree of vertical specialization, which amplifies its involvement in cross-border value creation (De Backer & Miroudot, 2013). This sustained participation reflects not only an export-oriented profile, but also an ability to capture value within increasingly fragmented production processes.
- While service sectors have historically shown lower levels of participation in international production networks, recent evidence points to a growing role for certain tradable services in GVCs. Notably, Financial and insurance activities (K), Transport and storage (H), and Wholesale and retail trade (G) display moderate shares of domestic value added embedded in foreign final demand. This trend reflects structural transformations associated with the servicification of manufacturing, where services are increasingly embedded in the production and delivery of goods (Lanz & Maurer, 2015). It also illustrates how specific services, particularly those with high knowledge content or intermediation functions, are becoming integral to cross-border value creation. As Miroudot and Cadestin (2017) argue, tradable services are no longer peripheral; they are now essential inputs in the coordination, financing, and logistics of global production systems.
- Structural persistence in domestically-oriented sectors. At the lower end of the distribution, Public administration (O), Education (P), Human health and social work activities (Q), and Construction (F) display minimal participation in foreign final demand across both periods. This confirms their orientation toward domestic provision of non-market or location-bound services, and is consistent with their weak inter-industry linkages observed in the previous subsection.
- Overall increase in foreign value-added intensity. Most industries show a slight upward shift in the share of domestic value added embodied in foreign final demand between 1995 and 2020, suggesting a broad-based deepening of trade integration in the region. However, this expansion appears uneven across sectors, with resource-based and export-oriented manufacturing benefiting the most.

Finally, the comparison of total gross output across APEC economies between 1995 and 2020 reveals notable structural changes in the regional distribution of productive capacity (see figure below). China (PRC) advanced from a relatively modest position in 1995 to become the economy with the highest level of gross output by 2020, surpassing Japan and approaching the output level of the United States. This increase reflects the sustained expansion of China’s industrial base and its growing integration into global production systems. While Japan and the United States continued to report high absolute levels of output, their relative weight within the region declined. At the same time, middle-income economies such as Australia; Korea; and Mexico experienced gradual growth, consolidating their position within the APEC production structure. In contrast, smaller economies, including Brunei Darussalam; Chile; New Zealand; Peru; and Viet Nam, remained at the lower end of the distribution, with comparatively limited variation over time. These trends point to a reconfiguration of regional production dynamics, marked by the rise of new economic hubs alongside persistent asymmetries in output levels among member economies.

Figure 12. Shifts in Total Gross Output in APEC Economies: 1995 and 2020



Source: Authors

2.6.2.3. APEC’s Sectorial Smile Curve:

The following set of figures illustrates the distribution of the origin of value added embodied in final demand, gross imports, and gross exports across three broad sectors, Primary, Manufacturing, and Services, for each APEC economy³.

³ In analyzing the smile curve, we must acknowledge two key limitations derived from the way the data are structured. First, the sectoral classification divides activities into three broad categories, primary, manufacturing, and services, which constrains the decomposition of data into finer productive activities. This limitation makes it difficult to distinguish between high- and low-value services, a distinction that is particularly relevant for capturing the smile curve pattern. Second, smile curve analyses tend to be more effective at the product or firm level; therefore, as the data become more aggregated (as in this study, which uses sectoral information), their explanatory

– Domestic Value for Domestic Demand

The first set of figures displays the sectoral composition of domestic value added that is both generated and absorbed within each APEC economy's final demand. That is, the data reflect the value added produced by domestic industries and consumed locally, excluding foreign trade components. The results reveal a consistent pattern across all APEC economies in 2020: the services sector represents the largest share of domestic value added absorbed by domestic demand, accounting for an average of approximately 68%. The manufacturing sector follows, contributing around 24%, while the primary sector shows the lowest share in all economies.

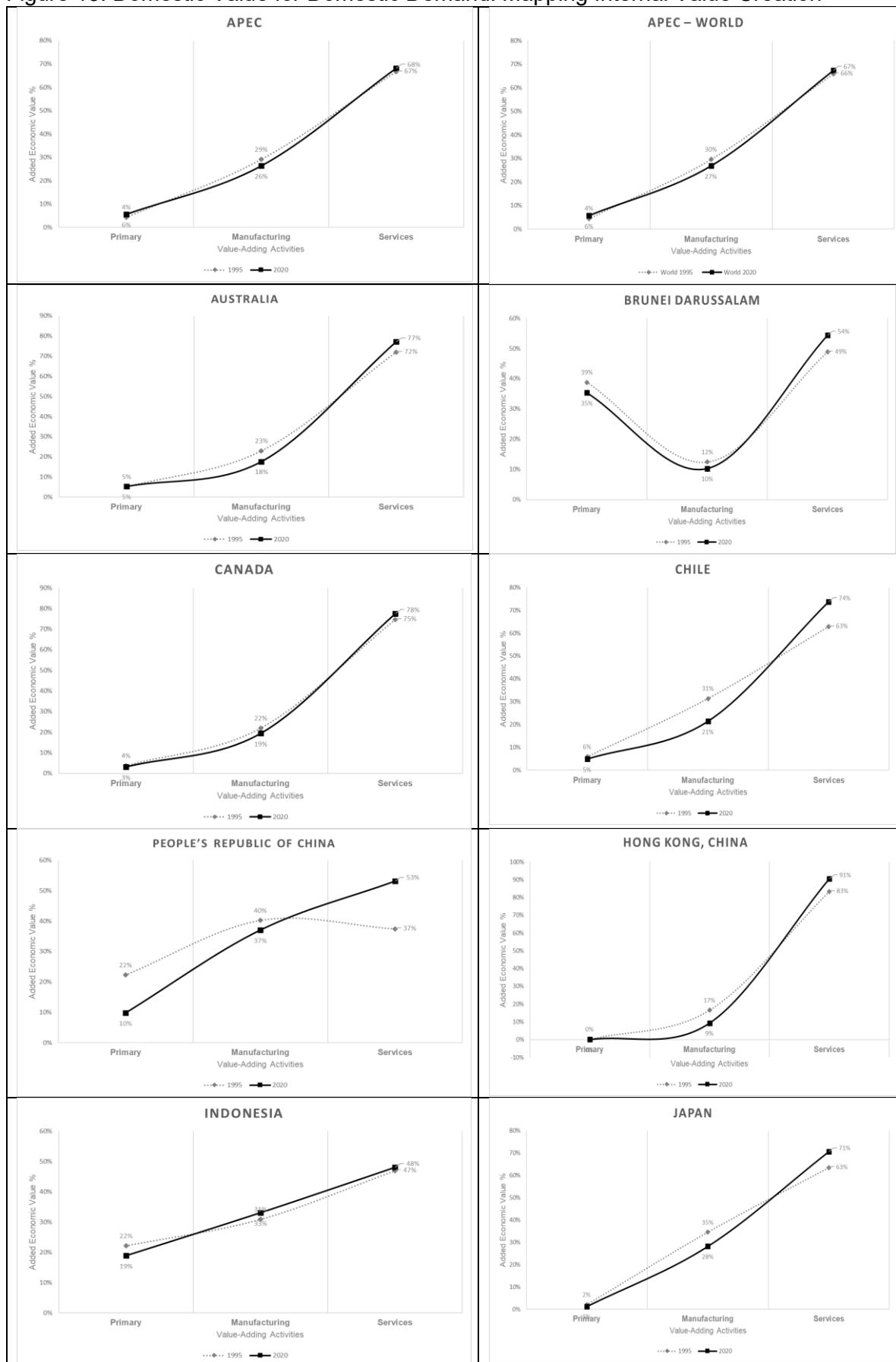
This distribution offers only a partial alignment with the smile curve hypothesis proposed by Mudambi (2008), which posits that the highest value-added activities are concentrated at both ends of the value chain, particularly in resource extraction and knowledge-intensive services, while manufacturing captures relatively less value. In the context of domestic demand, however, the pattern appears more linear than curved: value added increases progressively from the primary to manufacturing and services sectors, without a marked U-shape.

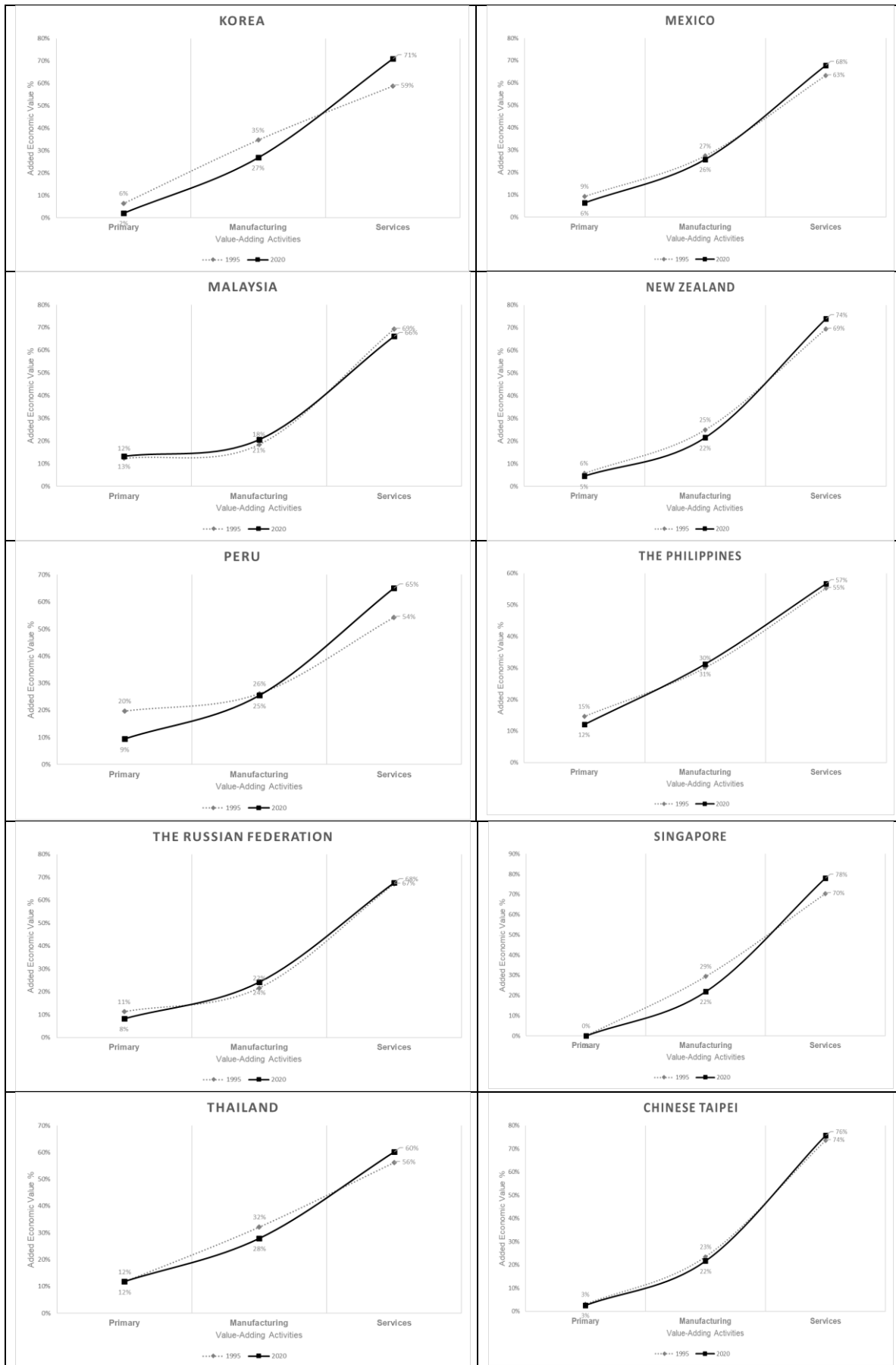
One possible explanation for this divergence is that the available sectoral aggregation does not allow for a clear separation between pre-production (upstream) services, such as R&D, design, and financial services, and post-production (downstream) services, including marketing, logistics, and customer support. These service segments typically occupy opposite ends of the value chain and differ significantly in terms of value creation. By grouping them under a single "services" category, the data may mask the internal heterogeneity of the sector and dilute the typical smile curve configuration observed in firm-level or task-based analyses. As such, the observed pattern may reflect a limitation in the level of disaggregation available, rather than a fundamental inconsistency with value chain theory.

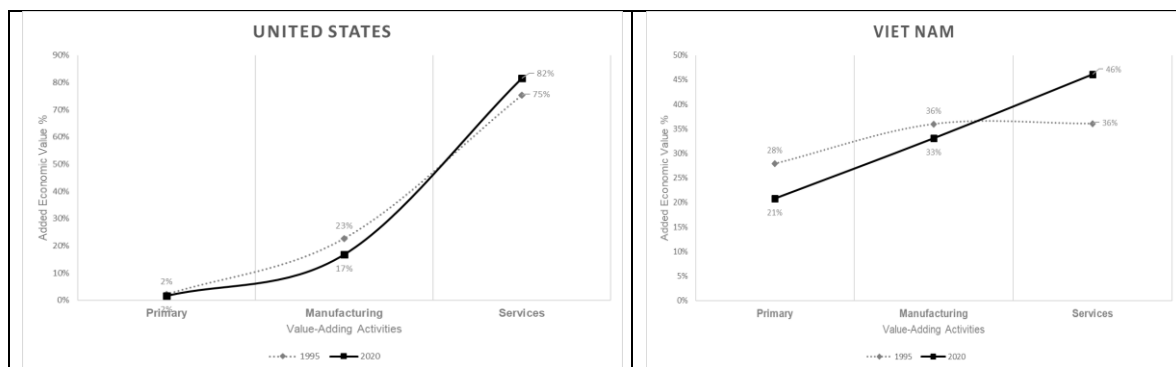
A temporal comparison between 1995 and 2020 indicates overall stability in this sectoral composition for most APEC economies. However, China and Viet Nam exhibit notable changes, with a declining share of primary sector value added and a rising share of services in their domestic final demand. These changes reflect structural transformation processes associated with economic development, diversification, and rising domestic consumption capabilities.

power tends to diminish. However, this approach still provides a useful overview of how value added is distributed across broad sectors and allows for cross-economies comparisons that highlight their structural differences.

Figure 13. Domestic Value for Domestic Demand: Mapping Internal Value Creation







Source: Authors

– Imported Value Added from APEC and Non-APEC economies:

The following figures illustrate the sectoral composition of value added embodied in imported goods and services across APEC economies, disaggregated by origin, including APEC, non-APEC, and rest of the world, and by broad sectors: Primary, Manufacturing, and Services.

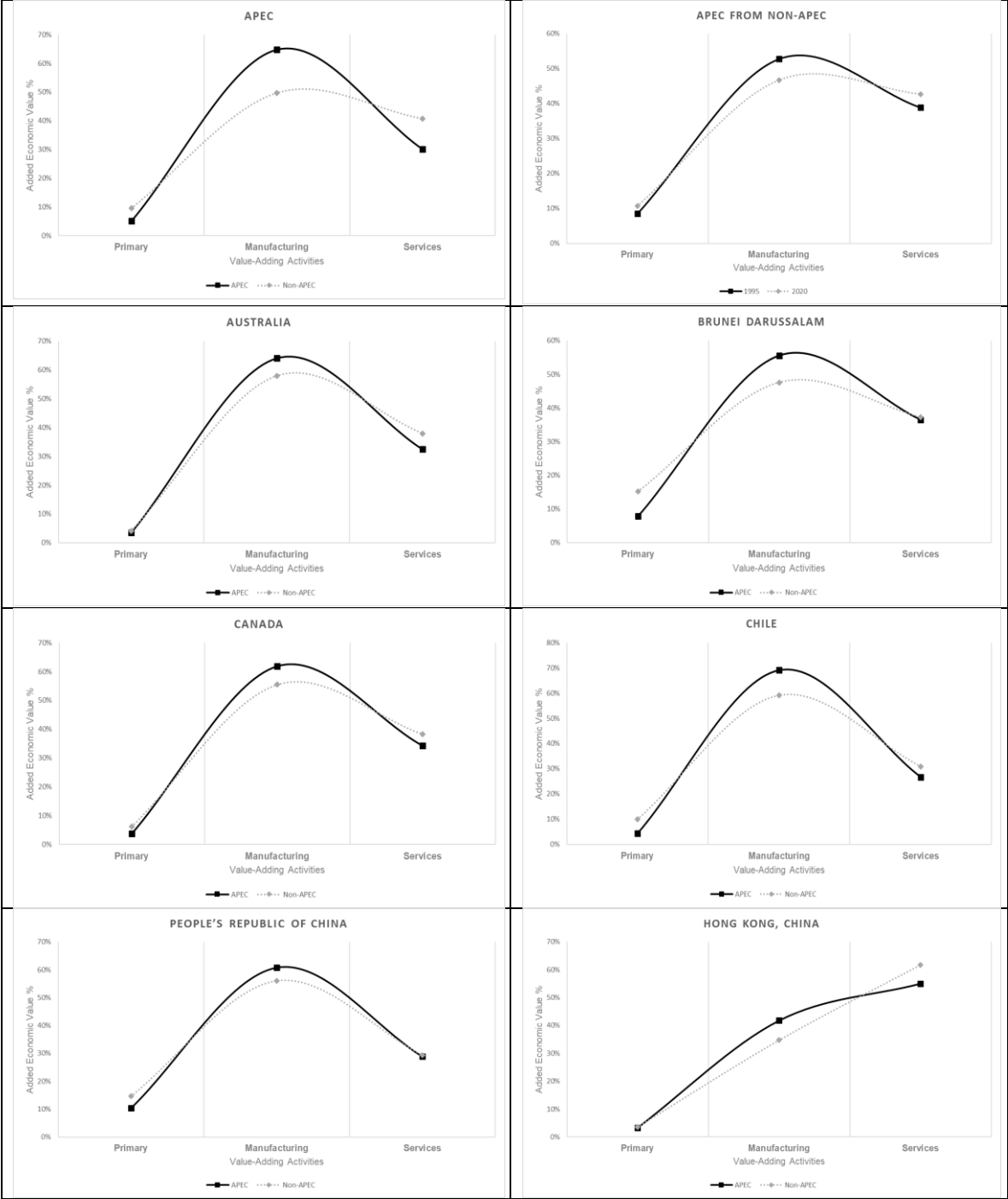
Across most economies, the distribution of imported value added exhibits a clear inverted “U” shape: the manufacturing sector consistently accounts for the highest share of value added embedded in imported inputs, while the primary and services sectors contribute comparatively less. This pattern reflects the dominant role of manufacturing in international production fragmentation, where intermediate goods, especially components and semi-finished products, are widely traded across borders before reaching final assembly stages. This finding aligns with the literature on GVCs, which emphasizes the increasing trade in tasks and the growing importance of vertical specialization (Grossman & Rossi-Hansberg, 2008; Hummels, Ishii & Yi, 2001), particularly in manufacturing-intensive sectors.

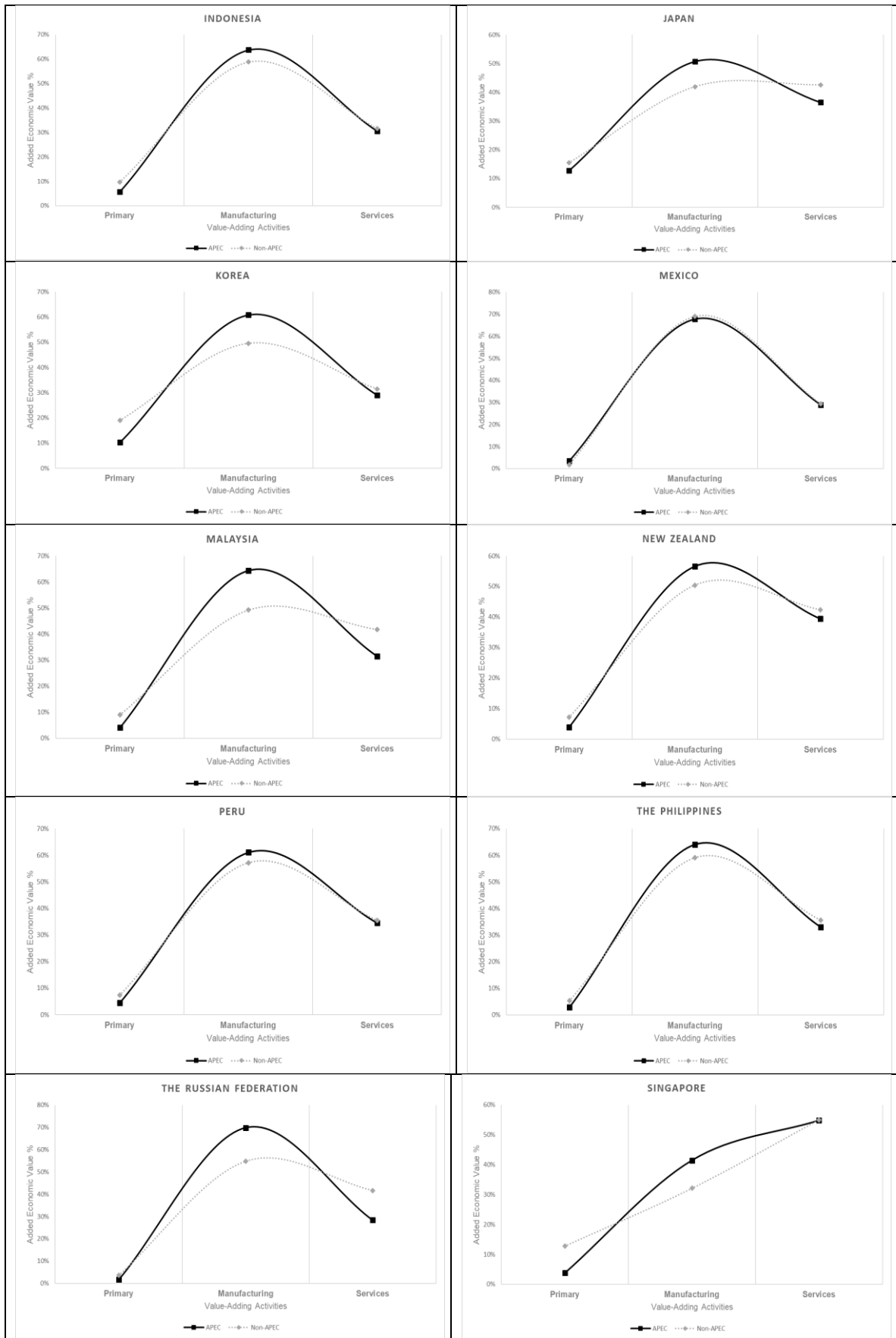
Notably, Singapore and Hong Kong, China diverge from this general pattern. In both economies, the services sector constitutes the main source of imported value added, followed by manufacturing and primary inputs. These exceptions are consistent with their specialization as service hubs within regional and global production networks, characterized by strong financial, logistics, and business service sectors that support trade and coordination but lack significant domestic manufacturing bases. As argued by Gereffi and Fernandez-Stark (2016), such economies often act as coordination and intermediation nodes within GVCs, facilitating cross-border flows without concentrating productive stages domestically.

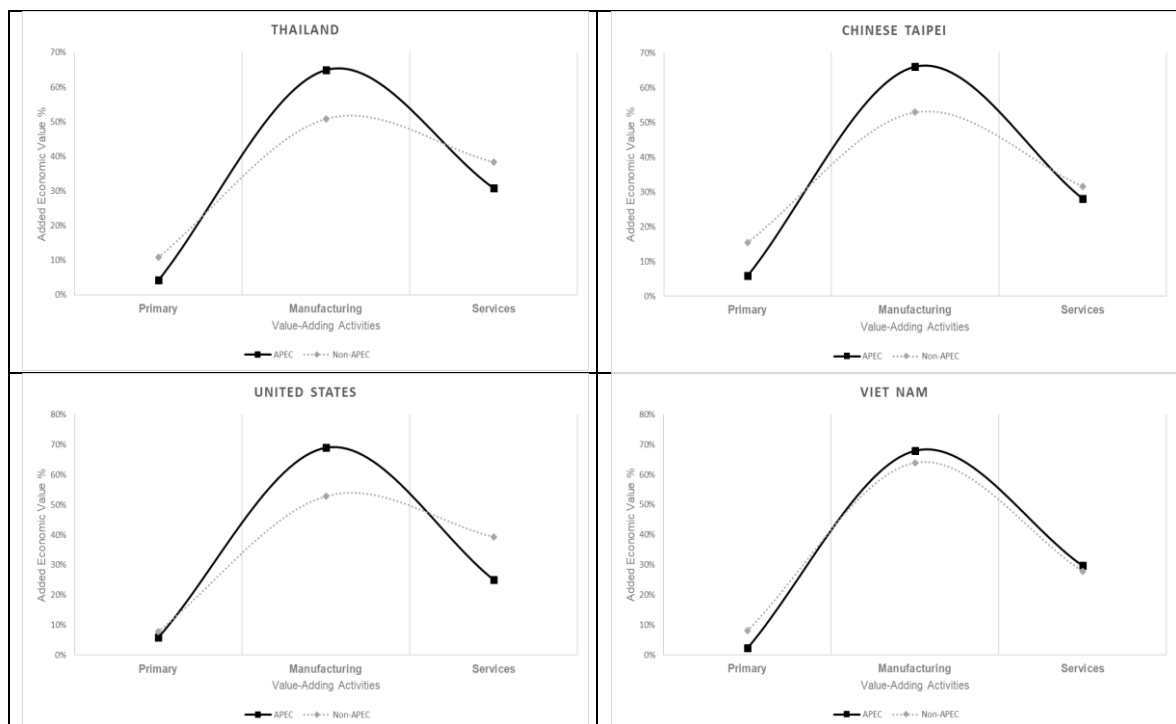
The temporal comparison between 1995 and 2020 reveals important structural shifts. On average, APEC economies exhibit a decline in the share of imported value added from services, coupled with an increase in manufacturing-related imports. This shift reflects broader trends observed in the Asia-Pacific region, including the rise of complex regional production networks, especially in East and Southeast Asia (Baldwin, 2012). The increasing reliance on imported

manufactured inputs may also be associated with the consolidation of “Factory Asia,” where economies specialize in specific segments of production, deepening interdependencies through trade in intermediate manufactured goods.

Figure 14. Imported VA from APEC and Non-APEC economies (Average 1995 & 2020)







Source: Authors

These results underscore the enduring importance of manufacturing within global trade structures and highlight the role of APEC economies as highly interconnected players within global production networks. The observed sectoral patterns also point to differentiated strategies of international integration, with some economies participate as producers of industrial goods and others as providers of services, reaffirming the relevance of task-based trade theory and the heterogeneous nature of value creation in global production.

– Domestic Value Added in Gross Exports (1995 and 2020)

The following figures below illustrate how domestic value added in exports is distributed across the primary, manufacturing, and services sectors in APEC economies for the years 1995 and 2020. This sectoral breakdown highlights notable cross-economy differences in export orientation, alongside signs of structural transformation in several member economies over time.

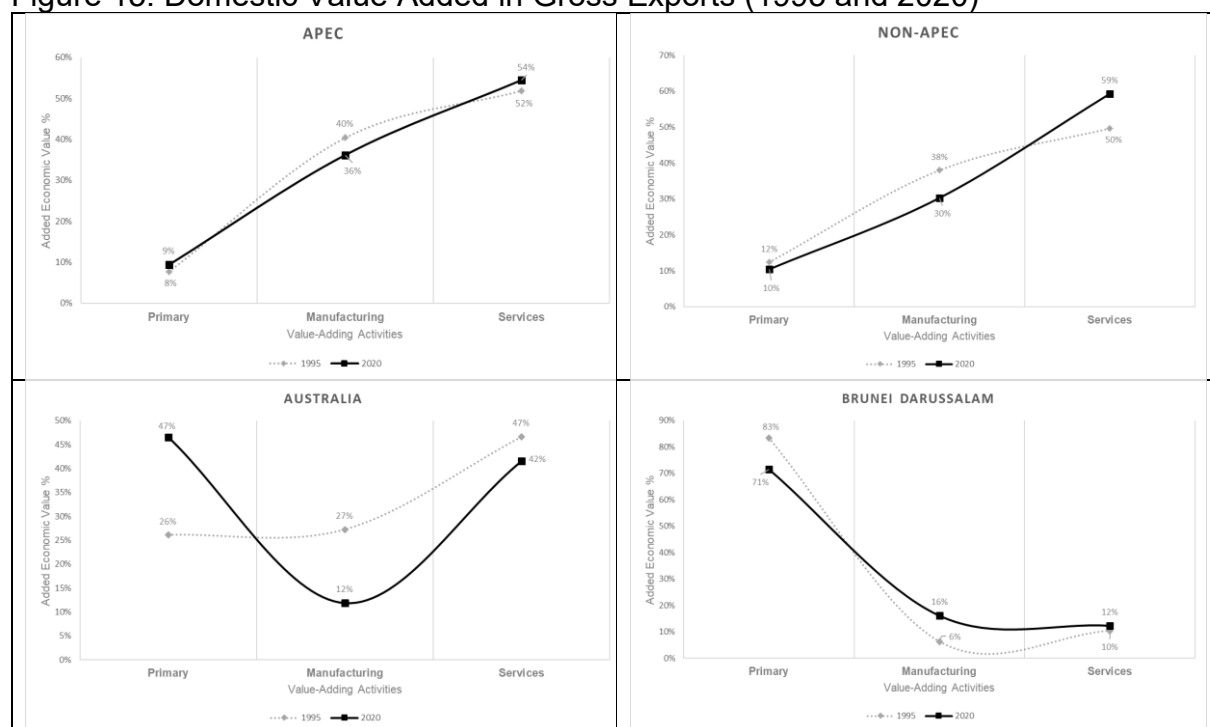
A group of economies, including Hong Kong, China; Singapore; and the United States, show a strong specialization in the export of services-based value added. In the case of Hong Kong, China this trend is particularly pronounced: by 2020, over 97% of its domestic value added in exports originated from the services sector. These patterns are consistent with the positioning of these economies as service-oriented hubs, highly integrated into global networks of finance, logistics, and knowledge-intensive business services. According to Gereffi and Fernandez-Stark (2016) and Miroudot & Cadestin (2017), such services have become increasingly tradable and central to GVCs, often accompanying or enabling the international exchange of goods.

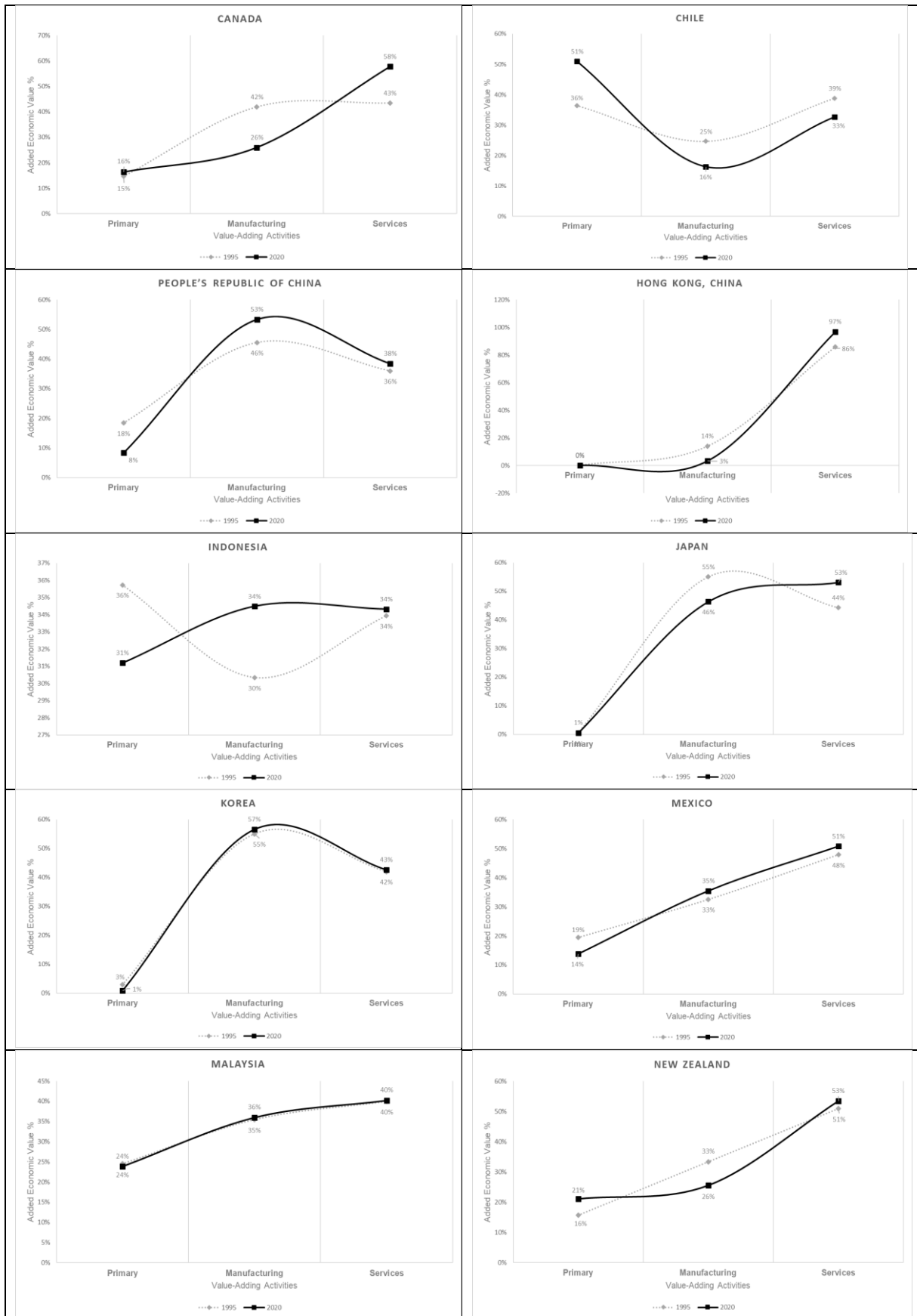
In contrast, economies such as China; Korea; and Chinese Taipei display a different profile, where the manufacturing sector remains the dominant source of exported value added. These economies reflect the classic model of export-led industrialization, with high levels of participation in the production and export of intermediate and final manufactured goods, embedded in complex regional and global supply chains.

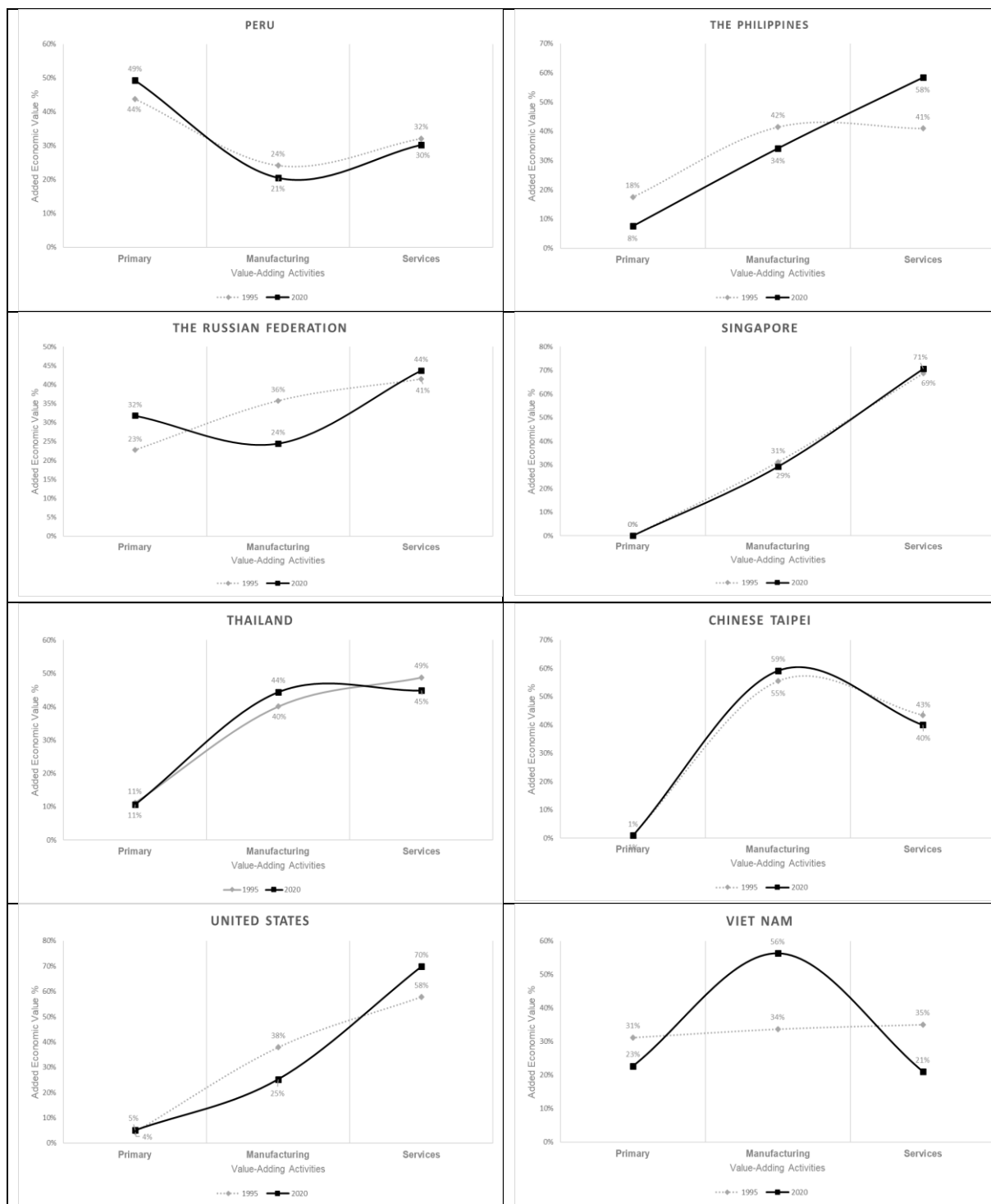
Over time, some economies have undergone notable transformations in the sectoral composition of their exports. Indonesia and Viet Nam, for example, show an increasing share of domestic value added in exports originating from the manufacturing sector, indicating deeper integration into industrial value chains and a shift away from reliance on primary exports. By contrast, Australia experienced a reduction in the share of manufacturing-related value added in its exports, accompanied by a rising proportion of primary sector value added, consistent with its role as a major exporter of natural resources.

At the aggregate level, the APEC region exhibits a mixed export structure. In 2020, the services sector accounted for the largest share of domestic value added embodied in exports, followed by the manufacturing sector, while the primary sector contributed less than 10% on average. This overall composition reflects the region's growing reliance on tradable services, but also masks important intra-regional differences in export specialization and participation in global production networks.

Figure 15. Domestic Value Added in Gross Exports (1995 and 2020)







Source: Authors

These findings underscore the structural heterogeneity of export profiles within the APEC region and suggest the coexistence of multiple development pathways. On one hand, a subset of economies has successfully transitioned toward service-intensive export structures, capitalizing on their comparative advantages in knowledge-based activities and their strategic positioning within global networks. On the other hand, several members remain embedded in manufacturing- or resource-based export models, either as part of mature industrial supply chains or as providers of raw materials. These diverging patterns

not only reflect differences in sectoral specialization, but also point to asymmetries in upgrading opportunities, technological capabilities, and policy frameworks. As such, the composition of domestic value added in exports offers a useful lens to assess how APEC economies are positioned within GVCs and the extent to which they are capturing the benefits of global trade integration.

Conclusions

The aim of this research was to analyze the structure and interdependence of APEC member economies in terms of economy-industry trade. These economies are characterized by increasing trade in intermediate goods and services in the context of GVCs.

The main findings highlight the heterogeneous contribution of APEC industries to foreign final demand in terms of value added. Sectors such as mining, energy, including both energy and non-energy sources, and manufacturing exhibit a relatively high proportion of value added embodied in foreign final demand, underscoring their strong integration into global markets. In contrast, service sectors such as public administration and defense, as well as human health and social work activities, show markedly lower levels, below 1%, of value added embodied in foreign final demand. This likely reflects their predominant orientation toward domestic service provision rather than international trade. Moreover, with the exception of the accommodation and food service activities sector, all industries with initially high levels of value added embodied in foreign final demand experienced an increase in their share between 1995 and 2020, suggesting a deepening of global production linkages over time.

Regarding industry linkages, the results show that most industries across APEC economies exhibit relatively low economic interdependencies. This pattern is characterized by the persistence of sectors with weak backward and forward linkages in both 1995 and 2020. Such persistence highlights the challenge of strengthening linkages across economic sectors to enhance multiplier effects throughout the economy. In contrast, another group of industries exhibits strong backward and forward linkages, positioning them as key industries where purchases and sales of inputs can generate significant multiplier effects across the economy.

The distribution of value added across primary, manufacturing, and service sectors is partially consistent with Shih (1996) and Mudambi (2008). For domestic final demand, many APEC economies show relatively high value added in primary and service activities, while manufacturing accounts for a comparatively smaller share. A different pattern emerges for imports, where manufacturing accounts for the largest proportion of embodied value added, while primary and service activities generally represent smaller shares. These results suggest differentiated forms of specialization across APEC economies and illustrate how domestic production and imported inputs contribute differently to value creation.

The sectoral composition of value added embodied in exports does not reveal a uniform pattern. Some economies, such as Singapore and Hong Kong, China, exhibit a relatively high share of value added embodied in service exports, while in other APEC economies a substantial share of exported value added originates in manufacturing activities.

With some exceptions, many industries across APEC economies exhibit considerable persistence in the sectoral composition of value added embodied in domestic final demand, imports, and exports over the 25-year period from 1995 to 2020. This persistence points to relatively stable roles within GVCs in terms of value creation and participation in different stages of production, although important differences remain across economies and industries. These structural patterns warrant deeper analysis, particularly for economies with relatively low participation in higher-value activities. They also highlight the challenge of strengthening economic cooperation and productive linkages, particularly among industries that persistently exhibit weak interdependencies, in order to enhance the broader economic effects of production and trade.

Regarding RTAs, the analysis reveals three fundamental insights into the evolution of Regional Trade Agreements among APEC economies from 1995 to 2020. First, the transformation of the network demonstrates a clear shift from predominantly geography-driven agreement patterns toward more complex configurations increasingly associated with GVC integration. While the 1995 network exhibited strong regional clustering, including an East Asian bloc and the NAFTA grouping, the 2020 structure shows greater trans-Pacific integration, particularly through the strategic positioning of GVC hubs such as China and the United States in distinct clusters. This finding is consistent with recent scholarship emphasizing how production fragmentation reshapes trade policy choices (Baldwin, 2016).

Second, the findings provide a more nuanced understanding of the factors shaping RTA formation. The emergence of hub-and-spoke patterns, in which central players such as Singapore and New Zealand, each with 18 linkages, connect economies across different regions, is consistent with social network theory's emphasis on preferential attachment (Barabási, 2005). However, the persistent peripheral position of The Russian Federation and Chinese Taipei, despite their participation in GVCs, suggests that political and economic factors may outweigh the logic of economic integration in some cases. Third, the analysis highlights APEC's evolving role in global trade governance. The 135% increase in intra-APEC RTA linkages, from 56 to 135, reflects growing institutional connectivity among member economies, although this process remains unevenly distributed. The concentration of agreements among certain members raises questions about inclusivity, particularly as Oceania, excluding New Zealand, and some Asian economies continue to exhibit relatively low levels of network embeddedness.

Further analysis could extend the identification of economic linkages beyond industries at the aggregate APEC level to examine linkages between individual APEC member economies and across economy-industry pairs. This would provide a more fine-grained understanding of economic interdependencies and the structure of production relationships within the region. Future research should also address some of the limitations identified in this analysis. In particular, greater attention should be given to the social dimensions of GVC participation, including its effects on employment quality, wages, working conditions, and social upgrading, which remain central to the broader challenge of achieving inclusive and sustainable globalization. Furthermore, the growing influence of digital trade, digital platforms, and technological innovation in areas such as fintech and logistics deserves deeper attention. These dynamics are particularly evident in digitally advanced APEC economies such as Korea; Singapore; and the United States, where they are reshaping value chain structures and global competitiveness. However, their uneven diffusion across APEC economies reveals persistent digital and technological gaps that need to be addressed through public policies and new strategies for trade integration.

CHAPTER II. Workshop on trade and investment inter-dependencies in Global Value Chains (GVCs): Analyzing the challenges and differences among SMEs in the APEC region

Introduction

In an international context marked by technological change and increasingly complex production systems, understanding how economies connect through trade and investment is key to designing effective development strategies. Within APEC, these interdependencies are particularly significant: the region concentrates some of the world's largest production hubs, most dynamic services, and key suppliers of critical resources for the global energy transition. In this context, the study and discussions presented at the *“Workshop on trade and investment inter-dependencies in Global Value Chains (GVCs): Analyzing the challenges and differences among SMEs in the APEC region”* focused on how APEC economies participate in GVCs and the drivers of their capacity to create, capture, and retain value.

The workshop, held on 7 and 8 August 2025, was organized and led by **Álvaro Espinoza** and **Joaquín Guerrero** from **Chile's Department of Global and Regional Value Chains (DGRVC) of the Undersecretariat of International Economic Affairs (SUBREI)**. It brought together experts from international organizations, academia, and government agencies to exchange perspectives on the trade and investment inter-dependencies that connect APEC economies and influence their participation in GVCs. Speakers included **José Durán Lima** from the **Economic Commission for Latin America and the Caribbean (ECLAC)**, **Stela Rubínová** from the **World Trade Organization (WTO)**, and **Ledys Franco** from the **Universidad Católica del Norte (Chile)**. The discussion focused on how trade and investment linkages shape production networks in the APEC region and what factors influence the ability of economies to move toward higher-value activities. Topics included the evolution of GVCs theory, methods for measuring trade in value added, and the role of innovation and industrial policy in strengthening productive integration.

During the first day, the discussions focused on understanding how GVCs have reshaped global production and trade, and on the analytical and methodological tools developed to study these transformations in the APEC region. The sessions focused on how economies can participate in GVCs through specialized functions such as research, design, manufacturing, and logistics, and how their position determines their ability to create and retain value. The discussions also highlighted the distinction between supply chains and value chains. Besides, it was emphasized that participation in GVCs does not automatically lead to development: upgrading depends on innovation, institutional quality, and the strength of domestic linkages. Finally, the presentations also explored how policy coordination and trade agreements can be used to promote productive integration and joint production initiatives. Chile's experience was presented as an example of how trade policy can be connected with industrial strategy to

encourage cooperation, technology transfer, and value creation across sectors such as electric mobility, agri-food, and the circular economy.

During the second day, the focus shifted to analyzing the structure of trade and investment inter-dependencies within the APEC region. The evidence presented showed that APEC forms one of the most interconnected production systems in the world, but with persistent asymmetries in value creation. Two major hubs dominate these networks: East Asia, led by China; Japan; and Korea; and North America, centered on Canada; Mexico; and the United States. Latin American members act as bridge economies, linking both systems through trade and production in sectors such as mining, agri-food, and manufacturing. The results also highlighted the growing role of tradable services, including logistics, R&D, and digital technologies, in regional production systems, signaling a shift toward service-based value creation. In parallel, the discussions addressed the relationship between GVCs participation and economic growth, noting that long-term benefits depend on economies' capacity to innovate, invest in human capital, and adapt to technological change, including digitalization and automation.

In conclusion, over the two days, the workshop highlighted that APEC's challenge is not to expand participation in GVCs, but to narrow the structural gap in how its members engage within them. While economies in North America and East Asia concentrate high-value activities in technology, design, and advanced services, several developing economies, particularly in Latin America and Southeast Asia, which remain tied to extractive, assembly-based, or logistics-intensive roles. The discussions also underscored the need to move beyond traditional supply chain integration, focused mainly on the physical movement of goods, to deeper value chain participation, where knowledge, innovation, and services drive competitiveness. Bridging this divide requires linking trade and investment frameworks with innovation systems, capability building, and productive diversification. Strengthening technological infrastructure, fostering SME participation, and promoting cooperation in research, skills development, and digital integration were identified as key pathways to achieve this.

The central message underscored that regional integration should evolve from participation to value creation, supporting all APEC economies members, at diverse stages of development, in advancing innovation, shared learning, and sustainable upgrading within global markets.

1. Day 1.

1.1. Day 1. Presentation 1: Understanding Global Value Chains – Concepts and Analytical Framework

The first presentation by Ledys Franco, Assistant Professor at the Universidad Católica del Norte (Chile), introduced the conceptual and methodological framework guiding this study. It explained how GVCs have reshaped global production and trade, emphasizing that participation does not automatically lead to upgrading and regional development. Drawing on the “Smile Curve” and insights from Evolutionary Economic Geography, Franco highlighted the need for innovation, institutional strength, and industrial policy to translate integration into value creation and local capture.

1.1.1. Objective and Conceptual Foundations

The first presentation marked the opening of the workshop and served as the conceptual foundation of the work developed for APEC economies under this study. Both this presentation and the subsequent one, were designed to share the main results of the analytical and empirical research conducted to assess trade and investment inter-dependencies across the APEC region. In this first part, Ledys Franco presented the conceptual and methodological framework that guided the study. She explained how GVCs have transformed the geography of trade and production, emphasizing that globalization today operates through the exchange of intermediate goods, services, and tasks, rather than finished products. Within this fragmented structure, economies compete not as isolated producers but as participants in complex production networks where firms and regions perform specific functions that contribute to a shared process of value creation.

Franco reviewed the evolution of the GVCs approach, originally developed to understand who benefits from globalization and how value is distributed along production networks. She highlighted the distinction between producer-driven and buyer-driven chains and discussed the concept of governance, which determines how power, knowledge, and coordination are exercised within these systems. Building on this, she introduced the “Smile Curve”, a central analytical tool of the study, which illustrates how value is unevenly distributed along the production process, high in pre-production stages such as R&D and design, and in post-production activities such as branding and logistics, but low in manufacturing and extraction phases.

The presentation then linked this global framework to the specific challenges of APEC economies, particularly the need to move beyond participation based solely on natural resource extraction or assembly. Drawing on insights from Evolutionary Economic Geography (EEG), Franco underscored that integration into GVCs is not automatically developmental. The capacity to upgrade and retain value depends on the institutional quality, innovation capacity, and territorial path dependencies of each economy. The comparison between successful cases such as Korea and Singapore and resource-dependent economies like Chile and

Peru illustrated how proactive industrial and innovation policies can turn global integration into a platform for domestic capability building.

A key message of this presentation was that participation in GVCs does not guarantee continuity within them. When integration occurs without strong domestic linkages, technological learning, and innovation systems, economies risk disarticulation, a gradual process through which they are pushed out or marginalized from higher-value segments of production. To illustrate this, Franco referred to the case of Detroit, historically known as the “Motor City” (see Box 1).

BOX 1. The Detroit Case: Lessons on industrial decline and value chain dynamics

The case of Detroit, United States, offers a striking illustration of how participation in global production networks, without continuous innovation and local capability building, can lead to long-term industrial decline. Once known as the “Motor City” and a global center of the automobile industry, Detroit became a symbol of technological progress and manufacturing excellence throughout much of the 20th century.



However, the city’s trajectory changed drastically from the 1970s onward. As global competition intensified, automobile production became increasingly fragmented, and many high-value activities, such as design, research and development, and corporate management, were relocated to other regions or economies. Detroit’s economy remained concentrated in assembly and low-value manufacturing functions, with limited diversification into emerging service or technology sectors.

This process reflects a broader lesson of GVCs theory: integration into international production networks does not automatically ensure upgrading or sustained competitiveness. Economies or regions that fail to retain and expand knowledge-intensive functions like innovation, design, logistics, and branding risk losing their strategic position within the value chain.

Detroit’s experience underscores the importance of continuous technological adaptation, policy coordination, and institutional support for innovation and skills development. For developing and resource-based economies, it highlights the need to leverage participation in global and regional value chains as a platform for capability building and diversification, rather than remaining locked into narrowly specialized or extractive roles.

Source: Adapted from Gereffi (1999), Sturgeon & Florida (2000).

For decades, the city was a symbol of industrial strength and technological leadership due to its concentration of automobile production. However, as global competition intensified and production networks fragmented, Detroit failed to renew its innovation base or diversify into emerging sectors. Its dependence on

large-scale manufacturing, without sustained investment in research, design, or advanced services, led to the relocation of high-value functions abroad.

1.1.2. Conclusions and policy reflections

The first section concluded by inviting participants to reflect on four guiding questions that help understand the challenges faced by economies participating in GVCs. The first question was: *What productive functions do we want to retain or develop in our territories?* Franco emphasized that not all activities should remain local, but economies must clearly define which ones are critical for maintaining innovation, learning, and employment. Retaining control over knowledge-intensive and coordination functions, such as research, design, and logistics, helps ensure that domestic actors continue to generate value rather than becoming dependent on external partners.

The second question asked: *Could a story like Detroit's be repeated in resource-dependent regions?* The case of Detroit served as a warning that even successful industrial regions can be disarticulated from global production systems if they fail to adapt to technological and organizational change. For resource-based economies, a similar outcome may occur when production remains focused on extraction or low-value manufacturing without innovation, diversification, or investment in human capital. Disarticulation, in this sense, represents not only economic decline but a gradual expulsion from higher-value segments of global production.

The third question addressed *how economies can move from a subordinate to a strategic position within GVCs*. Franco explained that this requires strengthening technological and organizational capabilities, promoting collaboration between firms, universities, and institutions, and embedding innovation processes into production systems. Building these capacities allows economies to reduce dependence, retain value locally, and develop a more active and coordinated role in global networks.

Finally, the fourth question focused on the role of industrial and institutional policies in supporting this transition and preventing the erosion of local capacities. Such policies are crucial for guiding investment, supporting supplier development, and linking resource-based sectors with knowledge-intensive services. They also help territories adapt to global changes while maintaining local strengths.

Overall, the presentation encouraged participants to think critically about how integration into GVCs can strengthen domestic production instead of weakening it. The central message was that participation should not be seen as an end in itself but as an opportunity to build the capabilities, policies, and partnerships needed to sustain development and avoid disarticulation from global production systems.

1.2. Day 1. Presentation 2: Trade and Investment Inter-dependencies in GVCs: Analyzing the Challenges and Differences in the APEC Region

The second section continued with a presentation by Ledys Franco, which built directly on the conceptual discussion of the first session. While the first presentation focused on understanding the theoretical foundations of GVCs and the risks of disarticulation, this second one moved to the empirical analysis of trade and investment inter-dependencies across APEC economies. Using multi-regional input–output data and value-added indicators, Franco studied how value added in domestic consumption, exports and imports have evolved in the region, identifying the asymmetries that shape specialization, value capture, and the potential for upgrading within APEC’s economies.

1.2.1. Objective and Context

The second presentation by Franco presented the core results of the study developed for APEC economies within the framework of this report. Building on the conceptual discussion introduced in the first presentation, this session applied the analytical tools of GVCs research to explore how APEC members are interconnected through trade, production, and investment linkages. The objective was to identify the structure and intensity of interdependencies within the region, assess the degree of domestic and foreign value added in production, and understand how these linkages influence sectoral specialization and upgrading opportunities. Using data from OECD Inter-Country Input-Output tables (OECD ICIO, 1995 & 2020), and OECD Trade in Value Added (TiVA) indicators, the analysis traced the evolution of APEC’s production networks over the past three decades, emphasizing both their growing density and persistent asymmetries.

1.2.2. Main Findings

Franco’s presentation showed that the APEC region has evolved into a densely interconnected production system, where trade and investment agreements have supported the fragmentation of production and the creation of cross-border value chains. Between 1995 and 2020, the number of intra-APEC Regional Trade Agreements (RTAs) increased from 56 to 135, linking all 21 economies. This network of agreements has reduced trade costs and encouraged production sharing, but the depth and quality of integration vary widely. Economies such as Chile; New Zealand; Singapore; and Viet Nam have become highly connected hubs, while others, such as Papua New Guinea and The Russian Federation, remain more peripheral.

The input–output analysis revealed that APEC economies participate in global production through asymmetric roles. The large economies of Asia and North America lead high-value segments of manufacturing and services, while smaller and resource-dependent members remain confined to lower-value stages. The most strategically interconnected sectors identified were finance, professional

services, chemicals, and energy, which exhibit strong forward and backward linkages, meaning they both supply and depend on inputs from multiple other industries.

In contrast, several resource-based economies maintain limited integration across sectors. The case of Chile exemplifies this pattern: while mining remains a key export sector, it functions as an enclave with few forward linkages to other domestic industries. Meanwhile, sectors such as finance, energy, and logistics have become more interconnected, suggesting that Chile's comparative advantage is gradually shifting toward service-based activities. Manufacturing industries such as chemicals and basic metals have lost systemic importance, reflecting a decline in domestic value retention and industrial diversification.

The presentation also analyzed value-added trade through the lens of the sectoral Smile Curve, showing that manufacturing continues to play a central role in imported value added, but tradable services, such as logistics, design, and innovation, are expanding their contribution to both domestic and external demand. This indicates a structural shift toward service-based value creation and highlights new opportunities for functional upgrading in the region.

However, the study also identified persistent challenges:

- Low domestic value capture in primary sectors, particularly in extractive economies.
- Deindustrialization trends in some advanced economies, reducing their manufacturing capacity.
- High vulnerability to external demand shocks, as export growth has not translated into wider domestic linkages or employment gains.

These patterns confirm that, although APEC economies are increasingly interconnected, the distribution of benefits within GVCs remains uneven.

1.2.3. Conclusions and policy reflections

Franco concluded that APEC's integration into GVCs presents both significant opportunities and persistent structural challenges. On one hand, trade agreements and investment flows have deepened interconnections among member economies, improving access to markets and fostering specialization. On the other hand, these linkages have not always translated into greater domestic value capture or productive diversification, underscoring that participation alone is not enough to ensure sustainable growth.

The study highlights the need for APEC economies to move from a model based on participation to one focused on value creation and capability development. This involves:

- Strengthening domestic production systems through targeted support for innovation, technology transfer, and supplier development that enables firms to climb toward higher value-added segments.

- Diversifying export and production structures, particularly in economies still concentrated in extractive or assembly activities, by fostering linkages between industry, services, and science–technology ecosystems.
- Deepening cross-economy cooperation within APEC, promoting joint research, technology partnerships, and knowledge exchange to connect resource-based sectors with manufacturing and knowledge-intensive services.

Franco emphasized that upgrading within GVCs requires a strategic connection between global and local actors, supported by long-term industrial, innovation, and skills policies. The evidence suggests that APEC’s main potential lies not only in expanding trade flows, but in transforming the nature of participation, from a focus on volume and integration to one centered on quality, learning, and domestic value retention.

BOX 2. Questions to reflect on

- **What are the main differences in how economies benefit from participating in GVCs through labor-intensive manufacturing versus through raw material exports, and what policies can help make such participation more inclusive?**

The pathways through which economies join GVCs have very different implications for inclusive growth. When participation occurs through labor-intensive manufacturing, it can be more inclusive because it directly generates employment and distributes income among a broader segment of the population. Workers gain access to better-paid jobs, and the benefits of value creation can be distributed more broadly across the economy. In contrast, participation based on raw material exports often produces concentrated benefits, as the rents derived from natural resource extraction accrue to a limited number of firms or sectors. To make this type of participation more inclusive, governments must play an active role in ensuring that the value generated translates into wider development gains. This includes promoting linkages between exporters and domestic suppliers, fostering technology transfer, and using fiscal or redistributive mechanisms, such as taxation and investment in public goods, to spread the benefits more broadly.

Sustainable upgrading requires building productive and institutional capabilities that allow economies to diversify into higher-value activities. This involves investing in education and skills to move into more knowledge-intensive stages of production, supporting innovation, and strengthening domestic linkages. Successful cases, such as Costa Rica’s experience with Intel, show that foreign investment can promote technological learning and entrepreneurship, though long-term benefits depend on continuous capability building and the ability to retain and expand domestic value creation as global firms and production networks evolve.

1.3. Day 1. Presentation 3: Internationalization of Companies and Productive Integration

The third section of the first day continued with a presentation by Chile's Department of Global and Regional Value Chains (DGRVC), part of the Undersecretariat of International Economic Affairs (SUBREI). The session, delivered by Álvaro Espinoza and Joaquín Guerrero, introduced Chile's economy-wide approach to linking trade policy with productive integration. It highlighted how international trade agreements can be used not only to open markets but also to promote investment, cooperation, and productive diversification.

The presentation was organized in three main parts. It began with a conceptual discussion distinguishing GVCs from traditional supply chains and explaining why Chile seeks to strengthen its role in value creation. It then outlined the institutional and methodological framework developed by SUBREI to identify opportunities for productive linkages. Finally, it presented a series of case studies illustrating how Chile has applied this approach in collaboration with partner economies.

During the APEC workshop, Chile's contribution complemented broader discussions about how member economies can use trade and investment frameworks to foster regional integration and capture a larger share of value within GVCs.

1.3.1. Conceptual Foundation

The DGRVC distinguishes supply chains, understood as logistical sequences of input flows, from value chains, where economic value is created and captured through research, design, production, marketing, and after-sales services.

This conceptual shift reframes Chile's role from resource supplier to co-producer of knowledge-intensive goods and services.

Rather than vertical subcontracting with lead firms, the policy promotes horizontal integration among regional partners, positioning Chilean firms as complementary nodes in shared production networks.

1.3.2. Policy Objectives

Chile's Global and Regional Value Chains agenda pursues four interrelated objectives:

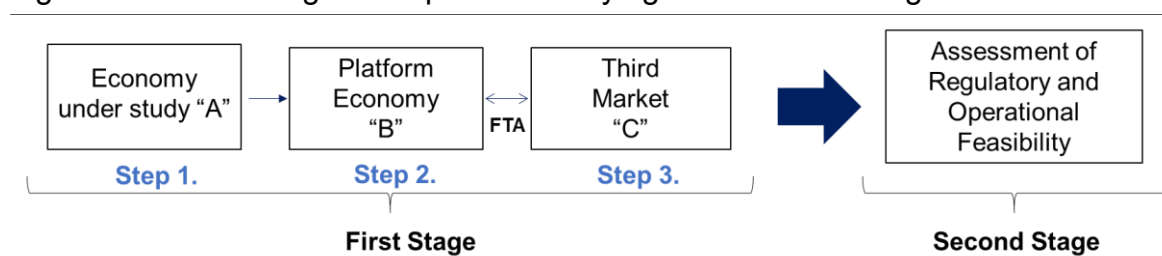
- Strengthen GVCs and RVCs through productive linkages that enhance regional complementarities.
- Identify business and investment opportunities connecting Chilean and foreign firms.
- Integrate value-chain provisions, including productive linkages and direct investments, into trade negotiations.
- Leverage Chile's trade-agreement network as a platform for co-production and export to third markets.

- Collectively, these aims seek to transform Chile from a passive trader into an active architect of regional production systems.

1.3.3. Analytical Methodology

The presentation outlined a two-stage methodology developed by SUBREI's Department of Global and Regional Value Chains to identify and promote potential productive linkages between Chile and partner economies. This approach combines trade data analysis, regulatory assessment, and collaboration with firms and institutions to translate trade agreements into concrete business opportunities. As shown in the figure below, the process unfolds in two main stages: an initial phase focused on identifying complementarities among economies, and a second phase that evaluates the regulatory and business feasibility of each potential linkage.

Figure. 1. Methodological Steps for Identifying Productive Linkages



Source: Authors, based on information from SUBREI's Department of Global and Regional Value Chains (presentation at the 3rd APEC Meeting, Korea, 2025).

As indicated in Figure 1, the methodology unfolds through two interrelated stages. The following explanation explores how each operates in practice, tracing the process from the detection of productive opportunities to their validation as viable linkage projects.

- **First stage: identification of trade and production opportunities**

The first stage focuses on detecting complementarities among economies by analyzing trade flows and market patterns. It is composed of three sequential steps that are applied flexibly depending on the role played by each participating economy within the linkage configuration. While Chile may act as the originating economy (A) in some cases, it may also operate as a platform economy (B) in others, receiving inputs from a partner economy and facilitating access to third markets.

- 1.3.3.1. Step 1. Product identification: this step identifies products exported by an originating economy (A) to global markets but not to a specific third market (C). These products represent untapped export potential that could be leveraged through productive cooperation. Importantly, the role of economy A is not fixed and may vary across cases.

- 1.3.3.2. Step 2. Platform economy analysis: this second step determines whether a potential platform economy, denoted as B, which holds preferential trade agreements with both the originating economy A and the third market C, exports the same products either globally or specifically to market C. This step captures the possibility of triangular production arrangements. In this context, Chile may act either as economy A or as economy B, depending on whether it supplies final goods or serves as a processing, assembly, or export platform for inputs originating elsewhere.
- 1.3.3.3. Step 3. Demand verification in the third market: the final step verifies whether the third market, denoted as C, is already importing those products from other global suppliers. This verification ensures that demand exists and that the proposed linkage is grounded in observable market dynamics rather than hypothetical trade potential.

Through this three-step process, SUBREI identifies opportunities for collaborative production arrangements among economies occupying different functional roles within the value chain. By allowing economies such as Chile to alternate between originating and platform positions, the methodology reflects a flexible and relational understanding of productive integration. This perspective is consistent with the workshop's broader emphasis on promoting cross-economy linkages as a mechanism to enhance resilience and value capture across APEC economies.

- **Second stage: regulatory and business feasibility analysis**

Once potential products and partners are identified, the second stage evaluates the regulatory, tariff, and operational conditions for building a viable productive linkage. This includes:

1. Analysis of rules of origin and accumulation provisions to determine whether intermediate goods or inputs from partner economies can be used without losing preferential tariff status.
2. Review of negotiated tariffs between the platform economy and the third market, and of the third market's Most-Favoured-Nation (MFN) rates.
3. Definition of potential business models, exploring production locations, cost structures, and export channels.
4. Presentation of preliminary results to counterparties for comments and joint definition of next steps.

This stage ensures that opportunities identified in Stage 1 are not only commercially viable but also consistent with existing trade and investment frameworks. It illustrates, in practical terms, how institutional coordination and policy coherence—two recurring topics in the workshop—can transform regional cooperation into concrete outcomes.

To show how this approach works in practice, the presentation included several examples of productive cooperation between Chile and other economies:

BOX 3. Examples of productive linkages

- **Chile–Brazil → Electric Mobility:** Through Reborn Electric Motors, Chile exported the first domestically manufactured electric bus to Brazil and later produced another for Antarctic operations. The initiative exemplifies green-technology diffusion within Latin America.
- **Chile–Guatemala → Wood Processing:** Chilean timber is transformed in Guatemala into floating floors, which are exported to the United States, showcasing multi-economy value creation.
- **Chile–Argentina → Agro-industry:** Under the Memorandum of Understanding on Value Chains, there is a Chilean company exploring a partnership with an Argentine firm to produce non-alcoholic beer, using origin-accumulation rules in the Chile–Mercosur agreement.
- **Chile–Ecuador → Circular Economy:** Firms in Arica use recycled Ecuadorian plastics to manufacture fruit crates, while Chile exports raspberry seedlings supporting Ecuador’s dairy and export industries.
- **Chile–Paraguay → Food Innovation:** The company Caayarimate imports yerba mate from Paraguay, processes it into cold beverages in Chile, and exports them to the United States, creating a branded consumer product through cross-border inputs.



1.3.4. Accumulation of Origin and the CPTPP Framework

The presentation also emphasized the importance of accumulation of origin in trade agreements, using the **Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)** as a key example.

Under this mechanism, inputs from any member economy can be used in production while maintaining origin status, as long as substantial transformation takes place. For Chile, this rule allows companies to import intermediate goods from partners such as Japan; Malaysia; or Peru, process them domestically, and export the finished products to other CPTPP members with preferential tariffs.

This provision facilitates more complex regional production chains and positions Chile as a potential hub for value-added transformation within APEC economies.

1.3.5. Digital Platform for Productive Linkages

To support implementation, SUBREI created an online platform⁴ where Chilean and foreign companies can explore opportunities for cooperation. The platform provides access to ongoing linkage projects, allows firms to register new initiatives, and includes a standardized questionnaire for partnership proposals.

This digital tool helps coordinate information and connect firms across borders, reducing transaction costs and promoting private-sector participation in value chain development.

1.3.6. Relevance for the APEC Discussion

Chile's presentation contributed to the APEC workshop by illustrating how trade policy can be linked to production and investment strategies. While many APEC economies focused on issues such as digitalization and logistics resilience, Chile emphasized **productive integration**—how economies can use trade agreements and cooperation mechanisms to develop new industrial capabilities.

The approach highlights several lessons for regional discussion:

- Trade liberalization should be accompanied by policies that encourage production linkages and innovation.
- Rules of origin can be used strategically to promote industrial cooperation among APEC members.
- Institutional coordination—connecting trade, industry, and investment agencies—is essential for translating agreements into productive outcomes.
- Digital platforms can strengthen transparency and facilitate SME participation in regional value chains.

⁴ Available at: <https://www.subrei.gob.cl/ejes-de-trabajo/cadenas-globales-de-valor-cgv/proyectos-de-encadenamientos-productivos/>

In this sense, Chile's experience shows a practical way to align open trade frameworks with development goals, contributing to APEC's broader objectives of inclusive and sustainable growth.

BOX 4. Key Insights from the Q&A Session

1. What kind of enterprises are you focusing on?

Our approach is quite flexible, but the priority is on small and medium-sized enterprises, including those that haven't yet begun exporting but show potential to do so. Large companies generally don't require government assistance since they manage their own production and trade networks. Each case must be assessed individually, with particular attention to the correct application of rules of origin, as this is key for the initiative to be effective.

2. You mentioned ongoing talks between Chile and the Philippines. Could the Authorized Economic Operator program be linked to global supply chains?

Not yet. The dialogue with the Philippines is just beginning, so it's too early to link it to that program. For now, the goal is to foster cooperation and promote an open exchange between both sides, possibly through shared experiences or expert meetings. In the end, the government's role is to support, but it's the companies that make the final decisions.

3. Could you explain what the specific provisions on global value chains include in the agreements already negotiated with Ecuador, Paraguay, and Brazil? Are these primarily cooperation clauses, and what do they mean in practical terms for implementation?

The provisions are quite general but significant because they formally incorporate the concept of global value chains into trade agreements. They focus on cooperation and dialogue between partners, marking a new stage where governments treat value chains as a distinct policy area linked to trade and productive development.

1.3.7. Conclusion

Chile's approach to global and regional value chains demonstrates how a medium-sized, resource-based economy can strengthen its position in global production systems through cooperation and policy coordination. By using trade agreements to promote joint production, encouraging linkages among firms, and investing in digital facilitation tools, Chile seeks to capture more value from its international integration.

Within the APEC context, this experience adds to the debate on how economies can move from participation in trade to active involvement in value creation—an issue central to the region's shared goal of achieving more resilient and inclusive value chains.

2. Day 2

2.1. Day 2. Presentation 1: The link between trade, production, and SMEs. The theoretical framework and methodology

The second day began with a presentation by José Durán Lima, Chief of the Regional Integration Unit at ECLAC. In his presentation, Durán outlined the conceptual foundations and methodological tools used by ECLAC to measure and analyze GVCs. The session explained how the institution operationalizes the concept of value chains by combining trade, production, and firm-level data to identify productive linkages across economies and sectors.

2.1.1. Objective and Context

Durán began by defining value chains as the set of productive relationships between industries that participate jointly in the production of goods and services, whether in the domestic, regional, or global market. He emphasized that understanding these linkages is relevant for assessing economies' ability to capture value, diversify exports, and foster innovation through integration in global production networks.

The presentation proposed a multi-method analytical approach based on four complementary perspectives. The first involves analyzing trade in intermediate goods using the Broad Economic Categories (BEC) classification to distinguish between primary, intermediate, and final goods. This approach helps estimate the degree of interdependence between economies through their trade in parts and components. The second perspective uses the Grubel-Lloyd index to measure the intensity of intra-industry trade, which serves as a proxy for productive integration. A higher index indicates a greater exchange of similar goods within the same industry, often associated with more developed production linkages and similar technological levels between partners.

The third perspective relies on input–output analysis, which represents the core of ECLAC's methodology. Through the construction of multi-country input–output tables, ECLAC measures how much domestic and foreign value added is embedded in the exports of each economy. These tables, harmonized for 18 Latin American economies and compatible with OECD and Asian Development Bank (ADB) databases, make it possible to trace how value moves through global production systems, quantify backward and forward linkages, and assess each sector's contribution to employment and emissions. Finally, the fourth approach incorporates microdata from firms to analyze how enterprises, especially SMEs, participate in supply networks and contribute to the formation of value chains.

Durán detailed the process followed by ECLAC to develop the Latin American Multi-Country Input–Output Table (LAC-IOT), a comprehensive framework that integrates domestic input-output matrices into a single regional database. This effort allows for consistent measurement of trade and production linkages between Latin America and its main partners, including those in the Asia-Pacific region. The harmonization process required aligning sectoral classifications, distinguishing between intermediate and final uses of imports, and balancing bilateral trade data to ensure consistency across economies.

From this framework, Durán highlighted several indicators that provide a clearer understanding of global production dynamics. The decomposition of gross exports into domestic and foreign value-added reveals how much value is retained within the exporting economy. The Rasmussen–Hirschman indices of backward and forward linkages identify the sectors that generate the strongest spillover effects across the economy, while measures of employment and CO₂ embodied in exports allow linking trade performance with sustainability and inclusion.

In conclusion, Durán emphasized that analyzing GVCs requires going beyond traditional trade statistics to capture the real value creation process. Exporting is not an isolated act but part of a complex web of import–export relationships in which firms, sectors, and economies interact simultaneously. For this reason, SMEs are crucial actors, as they provide intermediate goods, services, and innovation that sustain larger export-oriented industries. ECLAC’s methodological approach—combining trade data, input–output analysis, and firm-level information—offers a robust foundation for identifying productive linkages and designing policies that promote deeper integration and value creation within regional and global production systems.

BOX 5. Questions to reflect on

- 1. In what ways can small and medium-sized enterprises (SMEs) be better integrated into value chain analysis and policymaking, ensuring that their role in innovation and employment creation is more visible and supported?**

There is no single recipe to answer this question, but some possible pathways include improving data and measurement to make SMEs more visible in trade and production statistics; developing supplier programs that help small firms meet quality and certification standards; promoting partnerships with research centers and universities to foster innovation and technology transfer; facilitating digital adoption and access to finance so SMEs can upgrade their production processes; and aligning trade and industrial policies to encourage local linkages and participation in higher-value segments of regional and global value chains.

- 2. How can cooperation among APEC economies help less industrialized members move from resource-based participation toward higher-value activities within regional production networks?**

Cooperation within APEC can help less industrialized members move beyond resource-based participation by fostering technology transfer, joint research, and investment initiatives that link their primary sectors with manufacturing and knowledge-intensive activities. Strengthening regional supplier networks, sharing best practices, and facilitating SME participation can also support productive diversification and innovation. Through these forms of collaboration, economies can gradually shift toward higher-value functions within regional production systems and capture a larger share of value created across the network.

2.2. Day 2. Presentation 2: GVCs: The link between trade, production, and SMEs in APEC region: The empirical evidence.

The second section of the day continued with a new presentation by José Durán Lima, which complemented the previous one by moving from the conceptual and methodological framework to the empirical evidence. On this occasion, Durán applied ECLAC's analytical approach to examine how APEC economies are integrated into global and regional value chains, highlighting the main sectors, economies, and firms that shape the region's productive and trade linkages.

2.2.1. Objective and Context

The discussion in this section focused on understanding how trade, production, and firm-level interactions shape economic interdependence within the APEC region. It examined the degree to which APEC economies are linked through Global and Regional Value Chains (GVCs), the sectors where these connections are most significant, and the role that small and medium-sized enterprises (SMEs) play in sustaining and expanding these linkages.

The analysis combined three complementary dimensions. The first involved the study of intra-industry trade, which measures the degree of bilateral exchanges in similar goods and serves as a proxy for productive integration. The second employed multi-regional input–output (MRIO) analysis to decompose exports into their domestic and foreign value-added components, enabling a detailed understanding of where value is generated and retained within the region. The third-dimension incorporated microdata at the firm level, which allowed assessing the contribution of small and medium-sized enterprises (SMEs) to both trade and production networks. This integrated approach made it possible to map the structure of APEC's production systems and to identify potential areas for deepening regional and cross-regional linkages.

Through this presentation, Durán provided empirical evidence of how APEC economies participate in Global and Regional Value Chains (GVCs), building upon the theoretical framework previously introduced. The analysis combined trade data, intra-industry trade indices, and multi-regional input–output results to identify productive interdependencies within APEC. The presentation was structured around the following guiding questions:

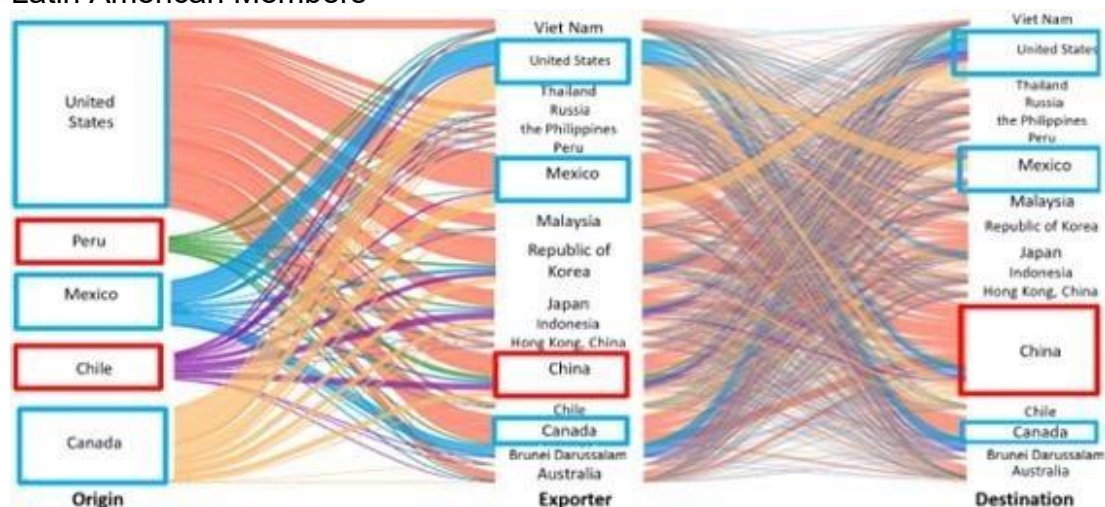
1. Do APEC economies participate in GVC?
2. Are there intra-regional value chains?
3. In what sectors?
4. What economies are participating?
5. How deep is the interregional integration in APEC economies?
6. Are there spaces for greater regional and intraregional integration (North America members and Asian members)?
7. How SMEs participate in value chains, and what space do SMEs have in the bi-regional trade and production linkages?

These guiding questions framed the empirical exploration of how APEC economies are connected through trade, production, and investment linkages. By grounding the analysis in measurable indicators, the presentation provided a foundation for understanding the dynamics of regional integration and the creation of value across APEC. This discussion served as a bridge toward the empirical results presented in the following section, which detail the main findings on inter-economy linkages and sectoral integration patterns.

2.2.2. Main Findings

The empirical evidence revealed that APEC economies are embedded in highly interconnected production systems structured around two major regional hubs. In North America, Canada; Mexico; and the United States form a tightly integrated manufacturing network. Mexico's participation in this system is particularly strong in the electronics, automotive, and steel industries, where nearly all trade with the United States corresponds to exchanges of intermediate goods. In East Asia; People's Republic of China; Japan; and the Republic of Korea maintain dense production linkages based on trade in parts and components, confirming their position as the manufacturing core of the region.

Figure. 2. Cross-Regional Integration Patterns within APEC: The Position of Latin American Members



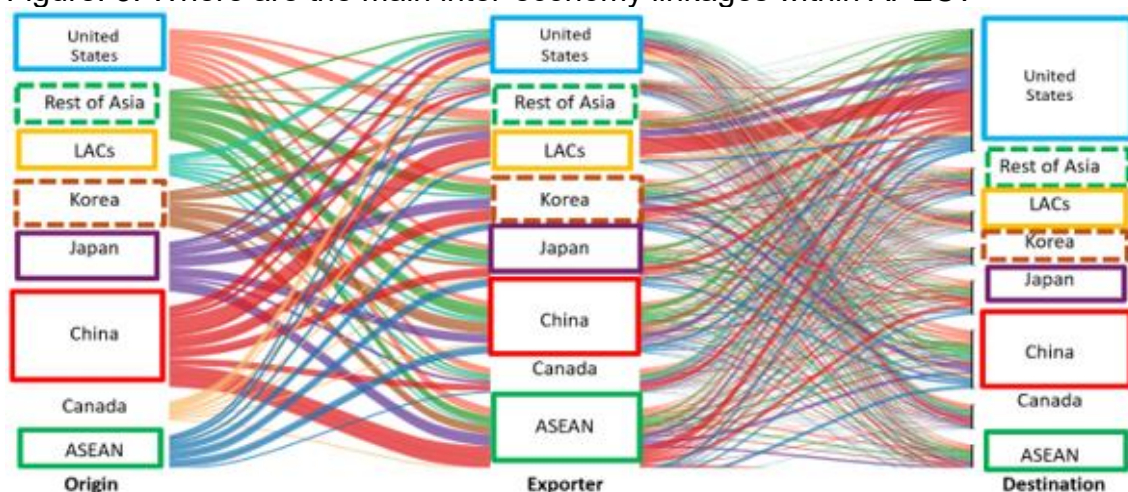
Source: Durán, APEC Workshop on Trade and Investment Inter-dependencies in GVCs, Incheon, 8 August 2025.

Among Latin American APEC economies, a clear pattern of cross-regional integration emerges. Chile and Peru exhibit strong trade linkages with China and Hong Kong, China, while Canada and Mexico are predominantly connected to the United States. This pattern underscores the coexistence of two gravitational centers of production and trade within APEC, one centered in Asia and the other in North America, around which Latin American economies align according to their productive and commercial specialization. As shown in Figure 2, Latin American APEC economies act as bridging nodes between these two major hubs. The visualization highlights the strong orientation of Chile and Peru toward China, consistent with their export structures dominated by natural resource–

based commodities, while Mexico and Canada remain embedded in the North American manufacturing network through high-technology industries.

Using data from the ADB–ECLAC global MRIO, Durán showed that approximately 47% of APEC's intra-regional trade is composed of domestic value added (DVA), reflecting a high degree of productive integration. The analysis further confirmed the key role of China in the trade of ASEAN economies and with Latin American members, alongside the dominant position of the United States in structuring North American production linkages. These findings are consistent with the network analysis presented in Figure 3, which illustrates the main inter-economy linkages within APEC, highlighting the dense connections among China; Japan; Korea; and ASEAN on one side, and the strong North American triad on the other.

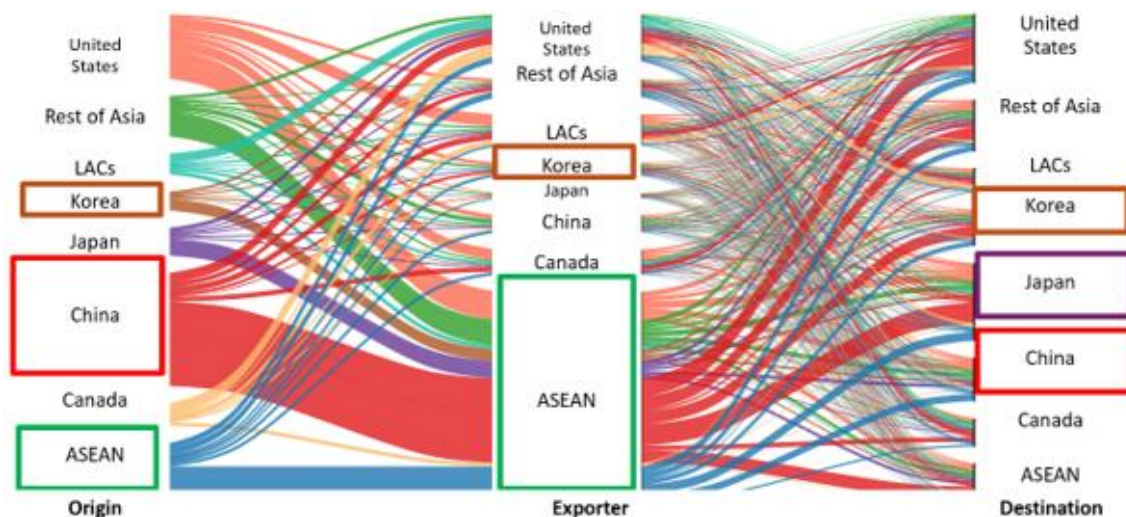
Figure. 3. Where are the main inter-economy linkages within APEC?



Source: Durán, APEC Workshop on Trade and Investment Inter-dependencies in GVCs, Incheon, 8 August 2025.

At the sectoral level, Durán highlighted the relevance of the food, beverage, and tobacco industries as a concrete example of cross-regional integration within APEC. In these sectors, Asia, particularly China; Korea, and several ASEAN members, plays a central role as a supplier of both primary and processed goods, which are later transformed or re-exported by other economies in the region. Figure 4 illustrates how the flow of value added in agri-food products connects Asian producers with destinations across APEC, including Latin American exporters such as Chile and Peru, which increasingly supply agricultural and food products to Asian markets.

Figure. 4. ASEAN, Korea, and China are among the main suppliers and partners in Agri-food sector



Source: Durán, APEC Workshop on Trade and Investment Inter-dependencies in GVCs, Incheon, 8 August 2025.

This pattern shows that agri-food production is not limited to traditional commodity exports but has become part of a broader network of intermediate and final goods trade. The integration of agricultural and processed food products into regional value chains illustrates how Asia functions as a key processing and distribution hub, while Latin American members contribute upstream through the supply of raw and semi-processed goods. These dynamics reinforce the complementarity between the two regions and reveal opportunities for Latin America to move into higher value-added segments within APEC's agri-food value chains.

Overall, the evidence confirms that APEC's production and trade networks are deeply interconnected, with Asia and North America acting as the main centers of integration. Latin American members, though less central, occupy increasingly strategic positions by linking both hubs and diversifying their participation in value-added trade, especially in sectors such as agri-food, manufacturing, and resource-based industries.

2.2.3. Concluding Insights

Durán concluded that the APEC production structure is organized around two interdependent yet asymmetrical systems. The Asian hub, led by China; Korea; and Japan, functions as the region's main supplier of intermediate goods and manufacturing inputs, while the North American hub, centered on Canada; Mexico; and the United States, focuses on assembly and the export of final products. Latin American APEC members, particularly Chile; Mexico; and Peru display distinct but complementary integration patterns, reflecting opportunities to strengthen cross-regional productive linkages and enhance cooperation between Asian and members of the region of America.

The presentation also underscored the importance of SMEs within APEC value chains. These firms play a vital role as providers of intermediate goods, components, and specialized services that sustain both export-oriented and domestic production. Strengthening their participation through policies that facilitate technological upgrading and integration into supplier networks was

highlighted as essential for achieving more inclusive, resilient, and diversified regional value chains.

Overall, the findings presented by ECLAC confirmed that APEC economies are deeply interconnected through value-added trade and production linkages. Understanding these dynamics is crucial for designing strategies that enhance the region's capacity to retain value, promote SME participation, and build a more balanced and sustainable pattern of economic integration.

BOX 6. Questions to reflect on

- **In a region where production is concentrated around two major hubs, what strategies can smaller economies adopt to position themselves in higher-value segments of these networks?**

With production largely concentrated in East Asia and North America, smaller APEC economies face the challenge of integrating into higher-value segments through functional complementarity. Strengthening local supplier networks, investing in research and skills, and fostering collaboration with firms and institutions from more advanced economies can facilitate this transition. The key is not only to diversify into new sectors but to climb within existing ones, turning resource endowments into platforms for innovation, technological learning, and knowledge-intensive activities. This process can generate important spillover effects across domestic industries—enhancing productivity, stimulating new service activities, and fostering technological diffusion—allowing smaller economies to capture a greater share of value and build stronger linkages within regional production networks.

Beyond participation, upgrading depends on the ability to innovate and absorb knowledge from global partners. Strategic collaboration between firms, universities, and research centers can foster learning and encourage the adaptation of advanced technologies. Governments also play a critical role by promoting policies that facilitate investment in research, digital transformation, and the development of competitive service sectors linked to manufacturing, logistics, and renewable energy.

Ultimately, the goal is not only to diversify production but to move up within existing industries, transforming resource and manufacturing advantages into platforms for innovation and technological upgrading. This process requires long-term institutional coordination and policy consistency to turn participation in GVCs into a driver of sustainable development, productivity growth, and regional convergence.

2.3. Day 2. Presentation 4: GVCs Participation and Economic Growth: Policy Implications

The last presentation of the workshop was delivered by Stela Rubínová from the Economic Research and Statistics Division of the World Trade Organization (WTO). Her intervention concluded the two-day discussion by connecting the analysis of trade and production linkages with the broader question of how GVCs participation influences economic growth and development. Drawing on evidence from the WTO World Trade Report (2024) and the WTO Global Value Chain Development Report (2023), Rubínová explained how technological change, digitalization, and new patterns of global interdependence are reshaping opportunities for APEC economies. The session highlighted the mechanisms through which GVCs integration can foster productivity and innovation, while also addressing the challenges that less industrialized members face in upgrading and capturing higher shares of value within global production networks.

2.3.1. Objective and Context

In her presentation, Stela Rubínová analyzed the relationship between GVCs participation and economic growth, with a focus on the conditions that enable economies to benefit from global integration and technological change. She reviewed how three decades of expanding GVCs have transformed international trade, contributing to income convergence, productivity gains, and technological upgrading, particularly in developing economies. Rubínová explained that the expansion of GVCs was closely tied to the reduction in trade costs, including transport, communication, and policy barriers, which allowed firms and economies to specialize in specific tasks rather than entire products.

This fragmentation of production made it possible for smaller and developing economies to participate in global trade according to their comparative advantages, thereby accelerating industrialization and income growth. The presentation set out to examine the drivers of GVCs participation, the mechanisms linking participation to growth, and the policy measures needed to adapt to emerging global trends.

2.3.2. Main Insights

Rubínová highlighted that participation in GVCs has enabled many economies to achieve structural transformation, shifting labor from low-productivity to high-productivity sectors. Integration into global production networks allows economies to access larger markets, adopt foreign technologies, and benefit from knowledge transfer through linkages between domestic and multi-economy firms. Local suppliers connected to foreign companies often gain access to managerial practices, quality standards, and technological know-how that strengthen domestic productive capacities.

However, she emphasized that joining GVCs is only the first step. Long-term growth depends on an economy's ability to upgrade within value chains, that is, to move from low-value-added to higher-value-added activities through innovation, R&D, services, and diversification. Economies that rely solely on

labor-intensive assembly or raw material exports remain vulnerable to external shocks and limited value capture. Rubínová explained that upgrading strategies involve strengthening domestic supplier networks, investing in research and skills, and expanding participation in post-production stages such as logistics, branding, and after-sales services.

Regarding the determinants of GVCs participation, she distinguished between structural factors, such as geography, distance to major hubs, and existing industrial capacity, and policy factors, including infrastructure quality, trade and investment frameworks, legal institutions, and education systems. The WTO Trade Cost Index shows that continuous reductions in trade costs have been crucial in sustaining GVCs expansion, driven by improvements in logistics, digital connectivity, and policy coordination.

Rubínová also discussed how emerging global trends are reshaping GVCs. Economic and geopolitical uncertainty, climate change, and technological disruption are prompting firms and economies to prioritize resilience and diversification over pure efficiency. She noted the rise of trilateral trade routes, where goods and components increasingly move indirectly between major economies (for instance, intermediate inputs from China reaching the United States through third economies).

The presentation further emphasized that digitalization and automation are transforming the nature of global integration. While automation has reduced opportunities for low-cost, manufacturing-led development, the growth of digitally delivered services, including cloud computing, data processing, and software, has opened new possibilities for developing and remote economies. Artificial Intelligence (AI), in particular, is expected to accelerate this shift by enabling new forms of production, lowering communication costs, and expanding opportunities in AI-related value chains linked to critical minerals, clean energy, and digital infrastructure.

2.3.3. Policy Implications and Future Directions

In her concluding remarks, Rubínová stressed that the future of GVC-led growth will depend on how economies adapt to this new global landscape. Maintaining an open and predictable trade policy is key to preserve the benefits of interdependence and minimize the risks of fragmentation. However, trade openness must be complemented by domestic policies that foster competitiveness, innovation, and inclusiveness.

Key policy areas include:

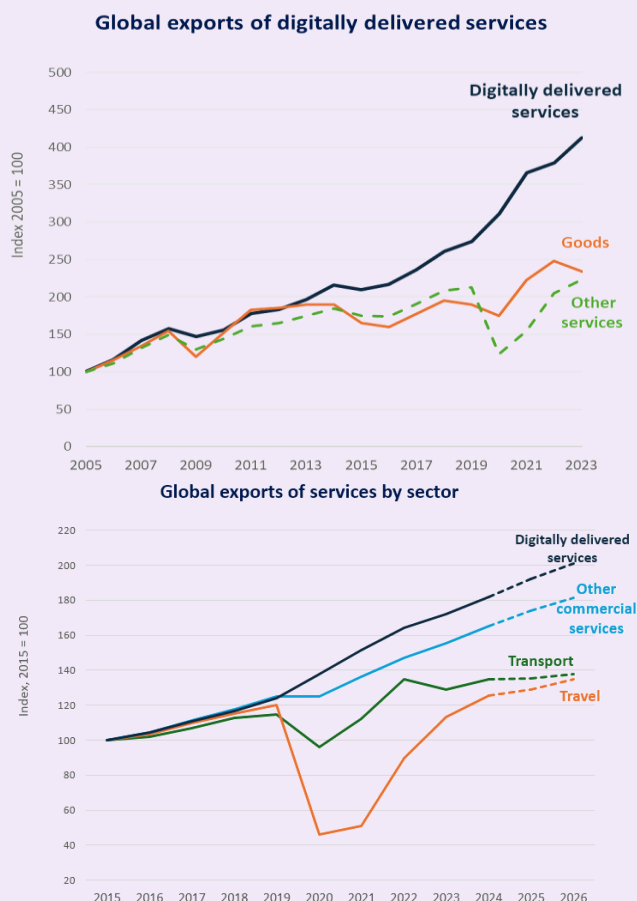
- Reducing trade costs through sustained investment in transport and digital infrastructure, efficient customs procedures, and regional connectivity;
- Promoting digital readiness, by strengthening education, digital skills, and regulatory capacity to participate in emerging service-based value chains;

- Encouraging innovation and technology transfer, especially through foreign direct investment and partnerships between local and multi-economy firms; and
- Building institutional and environmental resilience, ensuring that global production remains both sustainable and adaptable to future shocks.

Rubínová concluded that GVCs will remain a key driver of growth, but their composition is shifting toward digital and service-based activities. Economies that combine openness with policies supporting technological adaptation and structural transformation will be better positioned to capture value and generate more inclusive development in the coming decades.

BOX 7. The Rising Role of Digitally-delivered services.

The two figures illustrate a profound structural change in global trade: the increasing dominance of digitally delivered services as a key driver of value creation and resilience.



Source: Rubínová, APEC Workshop on Trade and Investment Interdependencies in GVCs, Incheon, 8 August 2025.

The first chart shows that exports of digitally delivered services have expanded more than fourfold since 2005, far surpassing trade in goods and other services. Their steady increase—even during periods of global crisis—reflects the rapid growth of digital platforms, cloud computing, e-commerce, and professional services.

The second chart provides a sectoral view, revealing that since 2015, digital services have consistently grown faster than transport, travel, and construction. Even during the COVID-19 crisis, they continued to rise and are projected to remain the most dynamic component of global exports through 2026, confirming their resilience and central role in world trade.

For APEC economies, this shift highlights the need to strengthen digital infrastructure, skills, and regulatory frameworks to fully capture opportunities in technology- and service-driven value chains.

BOX 8. Questions to reflect on

- **How the negative effects of Non-Tariff Measures (NTMs) on GVCs can be minimized?**

The general principles for applying NTMs in the least trade-restrictive way are similar for both GVC and non-GVC trade. It is important to recognize that not all NTMs are inherently trade barriers—many serve legitimate purposes, such as ensuring product safety or compatibility. For example, technical regulations and sanitary and phytosanitary (SPS) measures often enhance trade by increasing consumer and buyer confidence in product quality and safety. In the case of technical standards, they can also facilitate trade by guaranteeing that imported products are compatible with domestic technologies or production systems.

However, while NTMs can enable trade, they can also impose significant compliance costs on exporters and importers. These burdens are often heavier for small and medium-sized enterprises (SMEs) and firms in developing economies, which may struggle to absorb the fixed costs associated with meeting regulatory requirements or demonstrating compliance.

Therefore, the key policy challenge is to design and implement NTMs in ways that preserve their legitimate regulatory objectives while minimizing unnecessary trade costs. This means ensuring that compliance procedures are transparent, harmonized, and proportionate to risk—so that smaller firms and developing economies can participate more effectively in global value chains.

- **How is artificial intelligence (AI) expected to affect production costs and new opportunities for firms across APEC economies?**

Recent discussions highlighted that firms generally expect artificial intelligence to reduce production costs primarily by lowering communication and coordination expenses, making it easier to interact with customers, deliver products, and manage logistics. Beyond these efficiency gains, AI is also seen as a driver of productivity improvements across various stages of production.

At the same time, the growing demand for sustainability and the energy-intensive nature of AI are creating new opportunities for suppliers of critical minerals and renewable energy technologies. Economies with strong ICT infrastructure can also benefit from hosting data centers and providing cloud services, as seen in Bangladesh's emerging role in South Asia.

Moreover, AI is giving rise to a broader industrial ecosystem in which localized applications of large models, developed in advanced economies, can be adapted to specific market needs, opening space for innovation in smaller economies and among SMEs. However, realizing these opportunities will depend on access to reliable digital infrastructure and policies that strengthen preparedness for digital transformation.

2.4. Final Conclusions

The discussions throughout the workshop underscored that the benefits of global participation in trade and investment depend not only on integration itself but on how economies leverage this participation to foster inclusive and sustainable growth. Keeping trade and investment policies open, transparent, and predictable remains essential for enabling firms, particularly small and medium-sized enterprises (SMEs), to take advantage of global opportunities. However, further reductions in trade costs will increasingly hinge on technological progress and, critically, on government action to strengthen infrastructure, skills, and institutional capacities.

One of the key takeaways was that the digital transformation, while offering unprecedented opportunities, has also deepened existing divides. The diffusion of artificial intelligence (AI) and other digital technologies has benefited large firms that can rapidly adopt new tools, while many SMEs still struggle to capture these gains due to limited digital capabilities. Evidence from OECD studies shows that this gap in technology adoption is a growing source of productivity divergence between large and smaller firms. Addressing this challenge requires targeted policies that enhance digital literacy, promote technology transfer, and ensure that digitalization becomes a driver of competitiveness for all segments of the economy.

Participants also highlighted the importance of strengthening regulatory and institutional capacity to manage the emerging digital economy. High-income economies tend to have more comprehensive regulatory frameworks, whereas many developing economies appear more open only because they lack established digital policies. Building effective regulatory systems is therefore crucial, not to restrict trade, but to create the confidence and safeguards necessary for inclusive and secure digital participation. Balanced regulation can simultaneously ensure openness and provide the stability needed to attract investment and foster innovation.

Finally, the workshop concluded that participating in Global Value Chains (GVCs) is only the first step; the real challenge lies in transforming that participation into lasting economic and technological upgrading. This requires complementary policies that support structural transformation, encourage innovation, and facilitate the diffusion of knowledge across sectors and regions. Strengthening digital and physical infrastructure, investing in skills, and promoting collaboration between firms and institutions are essential to ensure that all economies, regardless of their level of development, can harness the full potential of GVC participation for sustainable and inclusive growth.

3. Analysis of Pre- and Post-Workshop Surveys and Key Findings

In connection with the Workshop on Trade and Investment Inter-dependencies in GVCs: Analyzing the Challenges and Differences among SMEs in the APEC Region, pre- and post-workshop questionnaires were administered to participants to assess their initial understanding and subsequent learning regarding on GVCs, and thereby evaluate the effectiveness of the training. These instruments will not only measure changes in awareness and knowledge, but also assess the extent to which the workshop enhanced participants' ability to identify current trends, key challenges, and emerging opportunities in GVCs participation.

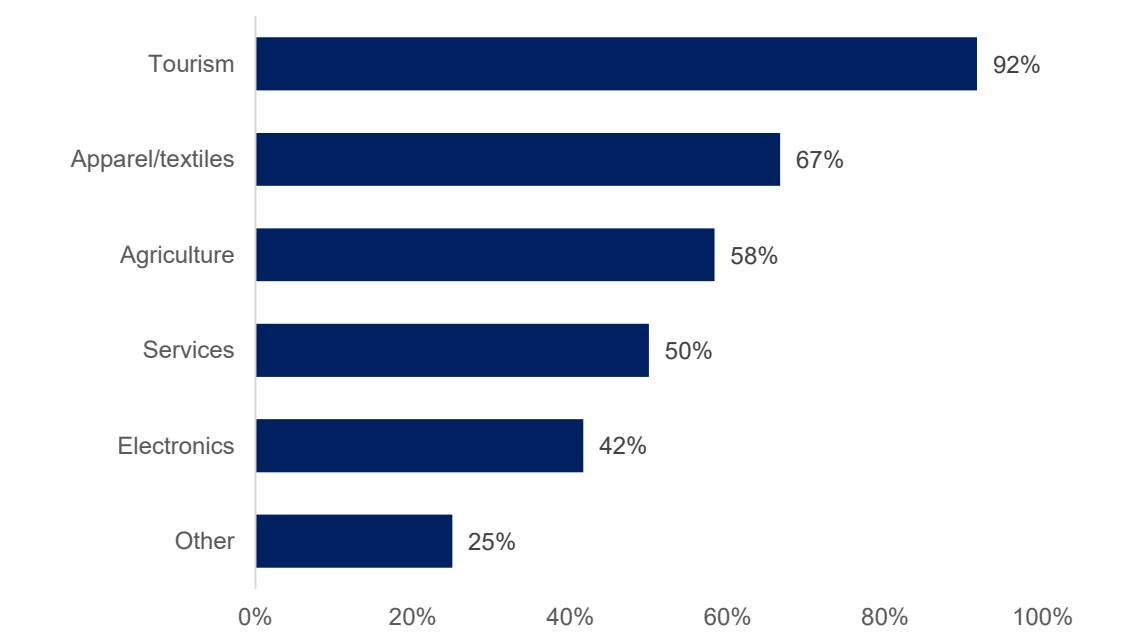
Preliminary results indicate that most participants began the workshop with a limited understanding of GVCs concepts; however, 80% reported a substantial improvement in their knowledge following completion of the program. Moreover, the majority of participants considered the workshop highly relevant to their professional and economic context, underscoring its practical value. The findings from these assessments will inform continuous improvements in the training methodology and support the design of future capacity-building initiatives.

3.1. Analysis of the questionnaire pre-workshop

A questionnaire was administered to the participants previously to the “Workshop on Trade and Investment Inter-dependencies in GVCs: Analyzing the Challenges and Differences among SMEs in the APEC Region,” held in Incheon, Korea, on August 7–8. The participants held technical, managerial, and consulting positions in various ministries, secretariats, and other government agencies from the following economies: Chile; People's Republic of China; Peru; the Philippines; The Russian Federation; Thailand; the United States; and Viet Nam. In total, thirteen questionnaires were completed. The instrument comprised nine questions, combining single-choice, multiple-choice, and short-answer formats.

The first question asked **whether the participants' economies had implemented initiatives to promote integration into Global Value Chains (GVCs)**. Seventy-five percent (75%) of respondents confirmed the effective implementation of such initiatives, while the remaining 25% indicated that initiatives were still under development. This result suggests that most economies have already taken concrete steps toward GVCs integration, though a smaller group remains in earlier stages of policy design or implementation. The second question examined **which sectors of their economies were most engaged in GVCs** (Figure 5). Tourism was the most prominent (91%), followed by apparel/textiles (67%), agriculture (58%), services (50%), and electronics (42%). Other sectors mentioned included consumer products, automobiles, mining, and manufacturing.

Figure 5. Sector most engaged in within GVCs



Source: own elaboration

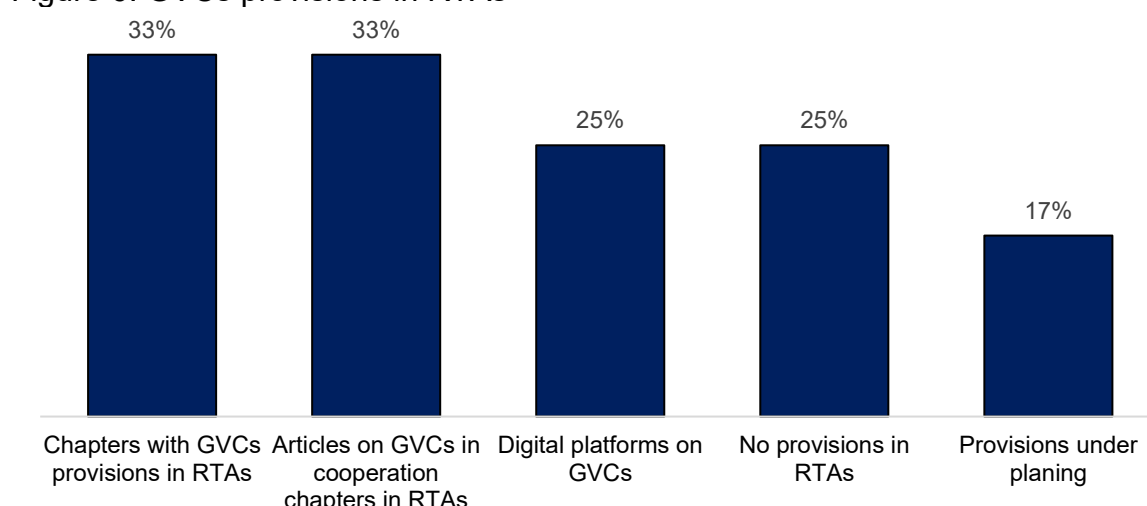
The third question focused on the **forms of government support available for firms' participation in GVCs** (e.g., grants, tax incentives, cluster programs). Respondents reported a variety of measures aimed at enhancing GVCs involvement. The most common were tax incentives, such as export facilitation programs and reimbursement schemes for specific sectors. Several economies also provide grants, financial assistance, and access to public funds. Additionally, cluster and networking programs are used to strengthen collaboration between large firms and SMEs and to promote foreign direct investment. Other forms of support include capacity-building initiatives, skills development, digital modernization projects, and assistance with regulatory and customs procedures to ease cross-border operations. Overall, government support combines financial instruments (e.g., grants, tax incentives) with institutional and capacity-building measures (e.g., training, cluster development, digital and regulatory facilitation).

The fourth question explored **whether GVCs-related provisions were included in trade agreements to facilitate engagement in these networks**. Seventy-five percent (75%) of respondents indicated the existence of such provisions, while 25% reported their absence in regional trade agreements. The main types of provisions mentioned are shown in Figure 6 and were "Chapters with GVCs provisions in trade agreements" and "Articles on GVCs in cooperation chapters," both representing 33% of responses, followed by "Digital platforms on GVCs," with 25%.

Question 5 allows a more detailed view of the types of cooperation instruments used to facilitate economies' engagement in GVCs. The responses show that GVC-related provisions in trade agreements are mainly concentrated in dedicated chapters or in articles embedded within cooperation chapters, and are

implemented primarily through traditional instruments, notably bilateral investment treaties and trade facilitation cooperation. In contrast, digital platforms specifically oriented toward GVCs play a clearly secondary role. This pattern suggests that, although a significant share of economies report having cooperation agreements in place, these arrangements remain largely framework-level and institutional, rather than relying on more operational and digital tools that could directly support firm-level participation and upgrading in GVCs.

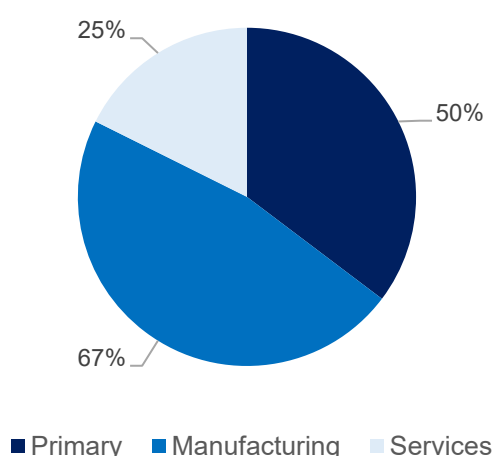
Figure 6. GVCs provisions in RTAs



Source: own elaboration

The sixth question asked **which sectors contribute most to domestic value added exported abroad** (Figure 7). The manufacturing sector received the highest number of mentions (33%), followed by the primary sector (50%) and the commerce sector (25%).

Figure 7. Sectors that contribute most to domestic value added



Source: own elaboration

The seventh question inquired about **which institutions are responsible for analyzing GVCs participation and providing policy feedback**. The analysis of GVCs participation and related policy advice is primarily carried out by

government ministries and economic agencies. Core institutions include ministries of commerce, industry, finance, and economic development, often in coordination with planning or economic development councils. In some cases, interministerial collaboration is emphasized, involving agencies responsible for trade, industry, agriculture, and foreign affairs. Research institutes and academic organizations also play a complementary role, providing analytical support and evidence-based insights.

The eighth question asked **what further support is needed to enhance participation and upgrading in GVC**. Participants highlighted the need for a stable and predictable global trade and investment environment as the foundation for deeper GVCs engagement. Many emphasized government actions, including increased budget allocation, structural reforms, and targeted investments in strategic sectors. Key areas for improvement include infrastructure and logistics development, enhancing manufacturing capacity, and upskilling the workforce to address talent gaps. Respondents also noted the importance of supporting SMEs, promoting technological advancement (e.g., big data, AI, R&D), and fostering scientific innovation and market access. Additionally, they called for greater international cooperation, experience-sharing, and clearer sectoral guidelines and strategies. Capacity-building initiatives, especially in digitalization and e-commerce, were also identified as a way to upgrade within GVC.

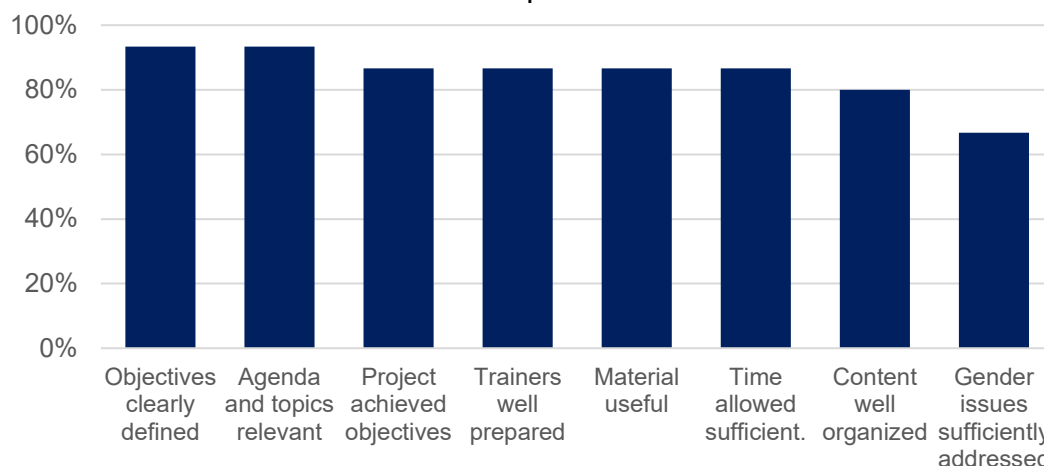
Finally, the ninth question asked about the **main challenges that APEC economies face in moving up the value chain**. The most common responses were “Unequal integration in RTAs” and “Infrastructure or logistics bottlenecks” (58%), followed by “Limited technological capabilities” (50%), “Lack of sectoral diversification” (34%), and “Skills and workforce gaps” (25%). Other challenges, cited by two participants, included high informality levels and a weak innovation ecosystem.

3.2. Analysis of the Survey post Workshop

At the end of the workshop, a survey was conducted among participants to assess the knowledge gained and evaluate the overall impact of the activity. The participants represented government agencies from the following economies: Chile; China; Indonesia; Peru; the Philippines and Thailand. A total of fifteen questionnaires were completed, each consisting of eight questions that combined Likert-scale items and short-answer responses. The first question contains an overall **evaluation of the workshop** (Figure 8) and reflected a highly positive assessment by participants. Regarding the clarity of the training objectives, 93% of respondents strongly agreed that they were clearly defined, while 7% agreed. Similarly, 87% strongly agreed and 13% agreed that the project successfully achieved its intended objectives. In terms of content relevance, 93% strongly agreed and 7% agreed that the agenda items and topics covered were pertinent to their professional needs. The organization and clarity of the content were also rated highly, with 80% strongly agreeing and 20% agreeing that the material was well structured and easy to follow.

With respect to inclusivity, 67% strongly agreed, 20% agreed, and 13% disagreed that gender issues were sufficiently addressed during the workshop's implementation. The performance of the trainers, experts, and facilitators received particularly an important recognition, as 87% strongly agreed and 13% agreed that they were well prepared and knowledgeable about the subject matter. The materials distributed during the sessions were also deemed valuable by 87% of participants who strongly agreed and 13% who agreed. Finally, 87% strongly agreed and 13% agreed that the time allocated for the training was sufficient to cover the topics effectively.

Figure 8. Overall evaluation of the workshop



Source: own elaboration

Regarding the second question, **which assessed the relevance of the project to participants and their respective economies** on a scale from very relevant (5) to not very relevant (1), the results indicate a strong perception of significance. Eighty percent (80%) of respondents rated the project as very relevant, while the remaining 20% considered it mostly relevant. This outcome reflects a broad consensus on the project's importance and applicability, suggesting that its objectives, content, and outcomes were closely aligned with the economic priorities and policy interests of the participating economies.

Participants provided several explanations to illustrate why the project was highly relevant to their economies and professional contexts. Many highlighted that the workshop offered valuable insights and analytical tools to better understand trade and investment inter-dependencies within GVCs, particularly in identifying opportunities for SMEs integration. Others emphasized the importance of developing long-term public policies and strategies to strengthen domestic value chains and support greater participation in global production networks.

Some participants noted that the methodologies and frameworks for measuring GVCs participation presented during the workshop were particularly useful for policymaking and capacity-building efforts. Several also appreciated the project's timeliness and innovative approach, as the topics addressed reflected the current economic context and emerging policy priorities. Additionally, respondents from economies still in the process of integrating GVCs concepts into economy-wide

strategies underscored the practical value of the workshop's content for advancing those efforts.

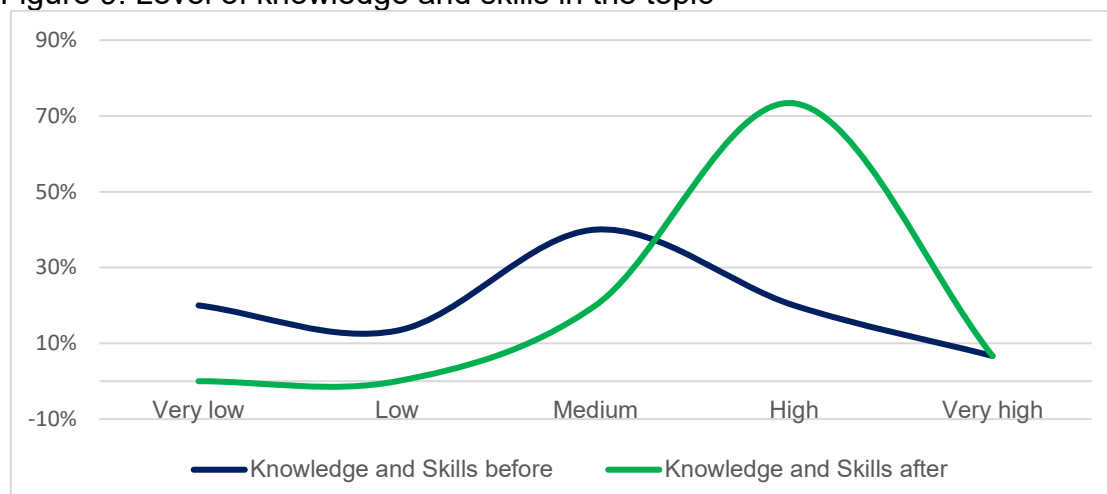
Regarding the project's **results and achievements** (Question 3), participants emphasized several key outcomes. They reported an enhanced understanding of GVCs and their connection to trade agreements, economy-wide policies, and value-added generation. Many respondents noted that the workshop helped build capacity and deepen knowledge, fostering a mutual understanding of the different roles and governance structures within GVCs. Participants also appreciated the exchange of experiences among economies, highlighting how such discussions revealed the need for well-designed public policies to help SMEs upgrade and capture more value in global markets.

In relation to **capacity building and new skills gained** (Question 4), participants indicated that the project helped them obtain a clearer and more comprehensive understanding of GVCs dynamics, particularly regarding trade barriers, investment linkages, and value-added measurement. Some participants mentioned learning about the "smile curve" concept, the relationship between free trade agreements (FTAs) and GVCs, and policy best practices that could enhance competitiveness. Others highlighted gaining analytical tools for trade data analysis and insights into sectoral diversification.

The **assessment of knowledge and skills before and after the workshop** (Questions 5 and 6) shows a clear improvement. Prior to the event, only 7% rated their knowledge as very high and 20% as high, while 40% reported a medium level and 33% a low or very low level. After the workshop, 7% maintained a very high level, but the share of participants reporting high knowledge rose sharply to 73%, and 20% indicated a medium level. Participants explained that the workshop helped them clarify complex concepts, understand GVCs linkages more comprehensively, and gain deeper insights into policy applications.

When asked **how they planned to use the knowledge and skills gained** (Question 6), participants outlined a range of actions, including developing new policies, strategies, and work plans; organizing training sessions; and drafting regulations focused on SME upgrading and value creation. Others mentioned disseminating the workshop's findings within their ministries or agencies and applying the lessons to improve customs procedures, investment facilitation, and regional cooperation. These intentions suggest a high level of commitment to translating workshop outcomes into tangible institutional and policy initiatives across participating economies.

Figure 9. Level of knowledge and skills in the topic



Source: own elaboration

For next steps by APEC (Question 7), respondents called for continued collaboration and follow-up activities, such as digital workshops, applied training sessions using real data, and sector-specific case studies. Some participants proposed that APEC should promote joint initiatives between regions, particularly between Latin America and Southeast Asia, to share best practices and explore new production linkages. Others recommended incorporating AI, digitalization, and trade-investment integration into future discussions, and ensuring that project outcomes are translated into concrete collective and individual actions.

Finally, **regarding project improvements** (Question 8), participants provided constructive feedback focused on content delivery and inclusivity. Some suggested simplifying overly technical or academic presentations, placing greater emphasis on policy implications rather than mathematical modeling. Others recommended including private-sector representatives, grouping economies by region for more context-specific analysis, and incorporating more practical exercises and case studies. A few also proposed extending the duration of the workshop and sharing presentation materials afterward. In summary, participants appreciated the workshop's quality but suggested a more applied, interactive, and inclusive design for future editions.

FINAL RECOMMENDATIONS

To foster more inclusive and sustainable participation in Global Value Chains, APEC economies should focus on a comprehensive policy approach that connects trade and investment openness with innovation, infrastructure, and skills development. Maintaining transparent, predictable, and rules-based trade and investment frameworks remains fundamental, but progress increasingly depends on complementary measures that reduce trade costs and strengthen productive capacities.

A first priority is to deepen efforts to enhance both physical and digital infrastructure. Efficient transport, logistics, and telecommunications networks are critical for competitiveness, as they facilitate the movement of goods, people, and information across borders. The growing importance of digitalization and artificial intelligence (AI) highlights the need for reliable ICT infrastructure and affordable access to digital services, which are prerequisites for broader participation in technologically advanced segments of global production.

Equally important is the development of human capital. Economies must invest in education and continuous training to prepare workers for evolving production structures and digital technologies. Closing digital skill gaps, especially among small and medium-sized enterprises (SMEs), is essential to prevent growing productivity disparities and to ensure that digital transformation benefits a wider share of firms and workers. Strengthening managerial and technological capabilities will allow domestic companies to absorb new knowledge, innovate, and move up the value chain. The regulatory environment must also adapt to the new realities of digital trade. Building the capacity to regulate emerging areas, such as data governance, cybersecurity, and e-commerce, is needed to balance openness with consumer protection and trust. Effective regulation should enable innovation while ensuring inclusiveness and confidence in digital markets.

In resource-based and developing economies, linking export sectors with domestic industries is key for maximizing local value creation and capture. Policies that encourage supplier development, technology transfer, and reinvestment of export revenues into innovation and diversification can transform participation in GVCs from dependency into long-term growth.

Finally, progress will require stronger coordination among public institutions, firms, and Universities. Collaboration across these spheres can promote research and innovation ecosystems, facilitate technology diffusion, and generate the evidence base needed for sound policymaking. Strengthening these partnerships will be key to narrowing the development gaps among APEC economies, ensuring that regional integration contributes to more balanced growth and shared opportunities across the region.

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Appendix A. List of Acronyms and Abbreviations Used in the paper

APEC	Asia-Pacific Economic Cooperation
AUS	Australia
BD	Brunei Darussalam
CDA	Canada
CHL	Chile
CT	Chinese Taipei
ECLAC	Economic Commission for Latin America and the Caribbean
FDI	Foreign Direct Investment
GCC or GCCs	Global Commodity Chains
GPN or GPNs	Global Production Networks
GVC or GVCs	Global Value Chains
HKC	Hong Kong, China
ICIO	Inter-country input-output
ICT	Information and Communication Technology
INA	Indonesia
JPN	Japan
MAS	Malaysia
MEX	Mexico
NTMs	Non-Tariff Measures
NZ	New Zealand
OECD	The Organisation for Economic Co-operation and Development
PE	Peru
PH or PHL	The Republic of the Philippines (the Philippines also acceptable)
PNG	Papua New Guinea
PRC	People's Republic of China (China also acceptable)
R&D	Research and Development
ROK	Republic of Korea (Korea also acceptable)
RTAs	Regional Trade Agreements
RUS	The Russian Federation
SGP	Singapore
THA	Thailand
TiVA	Trade in Value Added
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization
US or USA	United States
VN	Viet Nam
WTO	World Trade Organization

Appendix B. Classification of economic sectors

ISIC Rev.4 codes	Activity Code	Economic activity
A	A01_02	Agriculture and forestry
	A03	Fishing and aquaculture
B	B05_06	Mining and extraction of energy producing products
	B07_08	Mining and quarrying of non-energy producing products
	B09	Mining support service activities
C	C10T12	Food products, beverages and tobacco
	C13T15	Textiles, textile products, leather and footwear
	C16	Wood and products of wood and cork
	C17_18	Paper products and printing
	C19	Coke and refined petroleum products
	C20	Chemical and chemical products
	C21	Pharmaceuticals, medicinal chemical and botanical products
	C22	Rubber and plastics products
	C23	Other non-metallic mineral products
	C24	Basic metals
	C25	Fabricated metal products
	C26	Computer, electronic and optical equipment
	C27	Electrical equipment
	C28	Machinery and equipment, nec
	C29	Motor vehicles, trailers and semi-trailers
	C30	Other transport equipment
	C31T33	Manufacturing nec; repair and installation of machinery and equipment
D	D	Electricity, gas, steam and air conditioning supply
E	E	Water supply; sewerage, waste management and remediation activities
F	F	Construction
G	G	Wholesale and retail trade; repair of motor vehicles and motorcycles
H	H49	Land transport and transport via pipelines
	H50	Water transport
	H51	Air transport
	H52	Warehousing and support activities for transportation
	H53	Postal and courier activities
I	I	Accommodation and food service activities
J	J58T60	Publishing, motion picture, video, television programmer production; sound recording, programming and broadcasting activities
	J61	Telecommunications
	J62_63	Computer programming, consultancy, and information service activities
K	K	Financial and insurance activities
L	L	Real estate activities
M	M	Professional, scientific and technical activities
N	N	Administrative and support service activities
O	O	Public administration and defense; compulsory social security
P	P	Education
Q	Q	Human health and social work activities
R	R	Arts, entertainment and recreation
S	S	Other service activities
T	T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use

Source: Authors based on OECD (2021) and Guide to OECD Trade in Value Added (TiVA) Indicators, 2023 edition.

Annex 1. Agenda
Workshop on trade and investment inter-dependencies in Global Value Chains (GVCs):
Analyzing the challenges and differences among SMEs in the APEC region
7-8 August 2025–Incheon, Korea
(Songdo Convensia, Room 118)

Thursday, August 7

09:00 – 09:30 | Registration & Welcome.

09:30 – 10:00 | Opening Session.

- Opening remarks – Ms. Krasna Bobenrieth, Head of the APEC Department, Undersecretariat of International Economic Affairs of Chile.
- Introduction of the workshop and objectives - Mr. Alvaro Espinoza, Head of the Global and Regional Value Chains Department, Undersecretariat of International Economic Affairs of Chile.

10:00 – 11:00 | Presentation 1: Key Findings of the Research Paper – Ms. Ledys Franco, PhD in Applied Economics from the Catholic University of the North, Chile.

- Expert presentation of the Research Paper.
- Questionnaire.

11:00 – 11:30 | Coffee Break.

11:30 – 13:00 | Presentation 2: Key Findings of the Research Paper – Ms. Ledys Franco, PhD in Applied Economics from the Catholic University of the North, Chile.

- Expert presentation of the Research Paper.
- Interactive discussion among participants.

13:00 – 15:00 | Lunch Break.

15:00 – 16:15 | Presentation 3: Understanding the role played by Global Value chains and productive linkages in leveraging trade agreements – Mr. Alvaro Espinoza and Mr. Joaquin Guerrero, Global and Regional Value Chains Department, Undersecretariat of International Economic Affairs of Chile.

- Chile's presentation on Government Strategies on GVCs and Best Practices.
- Interactive discussion among participants.

16:15 – 16:30 | Coffee Break.

16:30 – 17:00 | Final Session of Day 1: Conclusions & Next Steps

Friday, August 8

09:00 – 09:15 | Recap of Day 1 & Objectives for Day 2.

09:15 – 10:15 | Presentation 4: GVCs: The link between trade, production, and SMEs. The theoretical framework and methodology – Mr. José Durán, Chief of the Regional Integration Unit, Division of International Trade and Integration, ECLAC from the United Nations.

- Trade analysis in gross terms, intra-industry trade as proxy of VC, input output approach to GVC analysis, use of microdata to analyze value chains linkages (VCs).
- Interactive discussion among participants.

10:15 – 10:30 | Coffee Break.

10:30 – 11:30 | Presentation 5: GVCs: The link between trade, production, and SMEs in APEC region: The empirical evidence – Mr. José Durán, Chief of the Regional Integration Unit, Division of International Trade and Integration, ECLAC from the United Nations.

- Empirical evidence analysis.
- Interactive discussion among participants.

11:30 – 13:00 | Presentation 6: GVC Participation and Economic Growth: Policy Implications - Stela Rubínová, Economic Research and Statistics Division World Trade Organization.

- Three Decades of Economic Growth through GVC participation, Drivers of GVC participation, the Future of GVC-led Economic Growth.
- Interactive discussion among participants.

13:00 – 15:00 | Lunch Break.

15:00 – 16:00 | Final Session: APEC Project Evaluation Survey & Conclusions.