

**Making the Grade: The Impact of Digitalization and Trade Agreements on New  
Zealand's Trade Involving Global Value Chains**

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## **Abstract**

The purpose of this dissertation is to examine the impact of digitalization and trade agreements on New Zealand's trade involving global value chains (GVCs). As a small, open economy, NZ's integration into GVCs is crucial for its economic growth and competitiveness. This study employed a mixed-methods approach, combining quantitative analysis of trade and economic data with qualitative content analysis of trade agreement provisions. This study revealed that NZ's GVC participation (including backward and forward GVC participation) showed a decreased trend between 2008 and 2020, despite it tried to integrate into global production networks. A positive correlation between digital adoption and GVC participation was observed, with increased Internet penetration rate and ICT use index corresponding to higher GVC participation. In addition, recent trade agreements with digital provisions, such as CPTPP and DEPA, have shown promising early results in facilitating digital trade and cross-border data flows. However, the benefits of digitalization and trade agreements are not uniformly distributed, with SMEs lagging larger enterprises in leveraging these opportunities. This study recommended targeted policies to support SMEs, continued investment in digital infrastructure, and prioritization of digital trade provisions in future agreements. Generally, this study helped to understand how small economies harness the complexity of GVCs in the digital age and provide valuable insights for policymakers and enterprises.

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## **List of Acronyms**

AANZFTA	ASEAN-Australia-New Zealand Free Trade Agreement
APTIAD	Asia-Pacific Trade and Investment Agreement Database
BP	Backward participation
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
CER	Closer Economic Relations
DAI	Digital Adoption Index
DEPA	Digital Economy Partnership Agreement
DESI	Digital Economy and Society Index
DVA	Domestic value added
FVA	Foreign value added
FP	Forward participation
FTAs	Free Trade Agreements
GVCs	Global value chains
GE	Gross exports
KNZFTA	Korea-New Zealand Free Trade Agreement
MBIE	Ministry of Business, Innovation and Employment
MFAT	Ministry of Foreign Affairs and Trade
NZ	New Zealand
PACER	Pacific Agreement on Closer Economic Relations
PDC	Pure double counting
RCEP	Regional Comprehensive Economic Partnership
SMEs	Small and medium-sized enterprises
USMCA	United States-Mexico-Canada Agreement
WTO	World Trade Organization

### **Attestation of Authorship**

*“I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor used artificial intelligence tools or generative artificial intelligence tools (unless it is clearly stated, and referenced, along with the purpose of use), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.”*

Students Signature \_\_\_\_\_

## **Chapter 1: Introduction**

This chapter aims to introduce the background to the research, research questions and objectives, rationale for the study, and outline the structure of this dissertation.

### **1.1 Background and Motivations**

In the rapidly evolving landscape of international trade and production, global value chains (GVCs) have emerged as a defining feature of the 21st-century global economy. The concept of GVCs refers to the fragmentation and distribution of production processes across multiple countries, with each stage adding value to the final product or service (World Bank, 2017). This phenomenon has fundamentally reshaped the nature of international trade, investment flows, and economic development strategies worldwide. A typical example is the iPhone. Although Apple designed the iPhone in California, but it carries out software development in the world, sources parts from more than 200 suppliers in 43 countries around the world, assembles in China and some other developing countries, and then distributes iPhone to the global markets (Dedrick et al., 2011). This complex production and value-added network embody the essence of GVCs in modern international trade.

The GVC-led trade greatly differs from traditional gross trade measures. Although gross trade statistics often include double counting and fail to capture the true nature of value creation, GVC-led trade focuses on the value added at each stage of production, encompassing both forward and backward linkages. To illustrate the difference, this study can expand on the iPhone example. A study by Xing and Detert (2010) found that the factory-gate price of an iPhone 3G was about \$179, but only \$6.50 was attributed to assembly in China. The rest of the value was added in various countries worldwide: \$16.08 in South Korea (for display and memory chips), \$13.04 in the US (for processors and controllers), \$4.70 in Japan (for the touch screen and camera), and smaller amounts in other countries. However, in gross trade statistics, the entire \$179 would be recorded as an export from China to the United States, significantly distorting the bilateral trade balance.

For small open economies like NZ, which rely heavily on international trade for economic growth and prosperity, understanding and effectively participating in GVCs is of paramount importance. NZ's unique geographical position, coupled with its relatively small domestic market, makes its integration into global production networks both a necessity and an opportunity for economic advancement. An example of NZ's participation in GVCs is its dairy industry. NZ is a leader in global dairy production and export. Fonterra and some other companies play a vital role in the global dairy value chain, including local dairy farming, milk collection, processing milk into dairy products, and exporting dairy products to global markets. This GVC makes full use of NZ's comparative advantage in pastoral farming and combines with global distribution networks. Dairy products occupy about 15% of NZ's total exports, a large part of which is included in the GVC (WTO, 2022).

De Backer and Miroudot (2013) considered that forward and backward linkages can be used to measure GVC participation. Among them, forward participation means that the domestic added value of export products is used to produce other countries, while backward participation refers to the foreign added value of a country's export products. For instance, NZ's dairy industry shows strong forward participation by providing milk powder for various foods around the world. However, compared with other OECD countries, NZ's overall GVC participation is lower. In 2018, NZ's GVC participation index was only 27.4%, which was much lower than the OECD average of 41.4%. Part of the reason for its low GVC participation was NZ's unique economic structure and remote geographical location (Guilhoto et al., 2022). Honey Consulting (2024) pointed out that although ASEAN is a digital power, NZ's digital exports to ASEAN are still low. It is noteworthy given that ASEAN is one of NZ's largest trading partners and technology is NZ's third largest export sector.

According to World Bank (2020), as two major trends, the rapid development of digital technologies and the proliferation of modern trade agreements have driven GVC participation

and evolution over the years. Digital technologies have lowered trade costs, promoted the coordination of GVCs, connected new players with international markets, and established new forms of trade in the field of digital delivery services. For NZ, the adoption of digital technologies in key export sectors is significant. In the agricultural sector that accounts for a large proportion of NZ's exports, 59% of farms used digital technologies as of 2020 (Stats NZ, 2021). At the same time, the proliferation of modern trade agreements is reshaping the international trade landscape. As of 2023, NZ is a party to 12 Free Trade Agreements (FTAs) in force and 4 under negotiation (New Zealand Foreign Affairs & Trade, 2023). These agreements cover about 67% of NZ's total trade (New Zealand Treasury, 2022).

Digitalization, encompassing technologies (such as big data analytics, artificial intelligence, cloud computing, blockchain, etc.) has fundamentally transformed how firms coordinate and manage their global production networks (Liao et al., 2017). These digital tools enable greater data sharing, traceability, and process optimization across various aspects of the supply chain, from production planning to logistics and inventory management (Strange & Zucchella, 2017). Digitalization's impacts on GVCs are manifold. It affects the efficiency and coordination of production processes, promotes market access, and changes the nature of tradable products and services. The NZ wine industry is an example of this transformation. Wineries have increasingly used IoT sensors and big data analytics to improve grape growth conditions, predict harvest time accurately, and manage inventories rationally. As one major wine exporter in NZ, Delegat Group has developed the digital supply chain system. The system can better coordinate its relations with global distributors and retailers and strengthen its position in the GVC of wine (New Zealand Winegrowers, 2022).

Additionally, trade agreements have gone beyond traditional tariff reduction measures and have begun to solve possible regulatory barriers and problems associated with GVC trade. Modern FTAs usually involve provisions that are aimed at coordinating regulations, liberalizing service and investment systems, facilitating e-commerce and digital trade,

formulating common rules for cross-border data flows, and protecting intellectual property rights (López González & Ferencz, 2018). In recent years, NZ has been actively seeking trade agreements to solve these modern trade problems. NZ is a signatory to the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). It is a model of a new generation trade agreement, involving substantive provisions on digital trade, regulatory coherence, and intellectual property rights. Moreover, NZ has taken the lead in signing agreements specifically targeting the digital economy, such as the Digital Economy Partnership Agreement (DEPA) with Chile and Singapore. Whereas, these are not the only agreements related to digitalization. NZ has integrated actively digital trade provisions into some recent trade agreements. Some NZ's trade agreements containing digitalization chapters or important digital trade provisions are shown in Table 1.1.

Table 1.1: NZ's trade agreements including digitalization chapters or significant digital trade provisions<sup>1</sup>

Trade Agreement	Year Signed	Digital Trade Provisions
CPTPP	2018	Chapter 14: Electronic Commerce
DEPA	2020	Entire agreement focused on digital economy
NZ-UK FTA	2022	Chapter 15: Digital Trade
NZ-EU FTA (negotiations concluded)	2023	Chapter on Digital Trade
AANZFTA Upgrade	2023	New chapter on Electronic Commerce

(New Zealand Foreign Affairs & Trade, 2024)

The aim of these agreements is to build a digital trade cooperation framework and promote digital economic growth. They contain various aspects of digital trade, involving cross-border data flow, emerging technology cooperation, paperless trade, and online consumer protection.

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<sup>1</sup> Digital trade chapters are usually special chapters in trade agreements that comprehensively focus on digital economy issues. Whereas, digital trade provisions are specific clauses or articles associated with digital trade, which can be included in various parts of an agreement even if there is no separate digital trade chapter.

The intersection of digitalization, trade agreements and GVC participation provides complex environments for NZ's trade policies and economic strategies. Although NZ has made great progress in digital applications and trade agreement negotiations, it is important to fully understand how these factors affect NZ's participation in GVC-led trade. Some studies have dealt with NZ's issues on this matter.

By examining the influence of Internet connectivity on NZ enterprises' international trade activities, Fabling and Sanderson (2016) argued that improved connectivity could increase exports, particularly for small and medium-sized enterprises (SMEs). Thus, digitalization is an important influencing factor of NZ's GVC participation. In addition, digital technologies and trade agreements are essential to boost NZ's economic growth in the future. It is necessary to analyze in more detail how these factors interact to affect NZ's trade patterns and participation in GVCs (New Zealand Productivity Commission, 2024a). Furthermore, Inomata and Taglioni (2019) emphasized NZ's unique position in GVCs and its backward linkages in food, beverages some other industries. Meanwhile, they indicated the potential to increase participation in services GVCs by means of digital technologies. However, their research does not specifically explore the role of trade agreements in promoting such participation. Whereas, they did not discuss the role of trade agreements in promoting GVC participation.

Existing literature has made great contributions, but there is still a gap in the comprehensive analysis of how digitalization and trade agreements jointly affect NZ's GVC-led trade. This study tries to fill this gap by analyzing the comprehensive impacts of digitalization and trade agreements on NZ's GVC-related trade. This could offer some useful insights for policymakers and enterprises in complex business environments.

## **1.2 Research questions and objectives**

Based on the above background, this study aims to deal with the following three research questions:

RQ1: How has participation in GVC-led trade evolved in the NZ economy?

RQ2: How has digitalization impacted NZ's participation in GVC led trade?

RQ3: How have trade agreements incorporated the elements of digitalization that facilitate GVC trade for NZ?

Accordingly, this study tries to achieve the following research objectives:

RO1: To investigate the evolution of participation in GVC led trade in the NZ economy.

RO2: To analyze the impact of digitalization on NZ's participation in GVC led trade.

RO3: To analyze the facilitation of trade agreements incorporated the elements of digitalization to GVC trade for NZ.

### **1.3 Rationale for the study**

Existing studies have examined the impacts of digitalization on the productivity and innovation of NZ enterprises (Deloitte, 2018) and simulated the potential GDP benefits of specific trade agreements (such as the CPTPP, etc.) (Gilbert et al., 2017). However, there is a lack of comprehensive research that directly studies how the combination of digitalization and trade agreements can affect NZ's GVC trade. This study could fill this gap.

In addition, this study is of practical significance. Digital technologies are changing all aspects of the economy, involving international trade (Tarifa-Fernandez et al., 2020). Knowledge is important for policymakers and enterprises to adapt to changing global economic environments and seize emerging opportunities.

By paying attention to digitalization's impacts, this study provided views on an important aspect of modern trade. For NZ enterprises utilizing digital technologies, they are likely to engage in exports and gain higher productivity (Fabling & Sanderson, 2016). With complex trade agreements, it is important to learn how the provisions of trade agreements affect the trade performance of NZ. Through the analysis of trade agreements and GVCs, Criscuolo and Timmis (2018) argued that this understanding may inform future trade negotiations and maximize benefits from existing trade agreements.

Moreover, the study would also supply useful implications for NZ's development of relevant trade policies. The New Zealand Ministry of Foreign Affairs and Trade (2022) viewed digital trade as a priority for NZ's trade strategy and developed corresponding policies. This can be achieved by examining the relationships between digitalization, trade agreements, and participation in GVCs.

#### **1.4 Structure of the dissertation**

This dissertation also covers four other chapters besides Chapter 1.

Chapter 2: Literature Review. It critically reviews existing literature on GVCs and GVC led trade, digitalization, trade agreements, impact of digitalization on GVC led trade, as well as the impact of trade agreements on GVC led trade. These theories could lay a theoretical foundation for this study to investigate the impact of digitalization and trade agreements on NZ's trade involving GVCs.

Chapter 3: Methodology. It determines and justifies the research methodology and methods employed in this study, mainly including overall research design, data collection and analysis techniques. This chapter will outline the mixed-methods approach adopted, combining

quantitative analysis of trade and economic data with a systematic review of trade agreement provisions.

Chapter 4: Results and Discussion. This chapter makes a comprehensive analysis of the collected secondary data from various sources, including the evolution of participation in GVC led trade in the NZ economy, the impact of digitalization on NZ's participation in GVC led trade, and the role of trade agreements incorporated the elements of digitalization in facilitating GVC trade for NZ. In addition, it discusses the results combined with the literature reviewed in Chapter 2.

Chapter 5: Conclusions and recommendations. It sums up the key results, acknowledges the limitations of the study, and makes recommendations for both future research and NZ Government to better participate in GVC led trade in the digital age.

## **Chapter 2: Literature Review**

This chapter aims to critically review the existing literature on GVCs and GVC led trade, digitalization, trade agreements, impact of digitalization on GVC led trade, as well as the impact of trade agreements on GVC led trade. These theories could lay a theoretical foundation for this study to investigate the impact of digitalization and trade agreements on NZ's trade involving GVCs. Then, it will determine the gaps in research.

### **2.1 GVCs and GVC-led trade**

#### **2.1.1 Concept of GVC and GVC-led trade**

In recent more than 20 years, GVCs have been widely studied in international trade literature. According to Gereffi and Fernandez-Stark (2011), GVCs mean the fragmentation of production processes between different countries and each stage adds value to final products or services. Technological progress, the reduction of trade barriers and the pursuit of cost-effectiveness by multinational corporations (MNCs) have contributed to the fragmentation. Gereffi et al. (2005) put forward a groundbreaking framework for learning the governance of GVCs and determining five types of value chain structures (i.e., market, modular, relational, captive and hierarchical). The framework emphasizes different degrees of coordination and power asymmetries in GVCs, which may greatly affect the distribution of values and opportunities for upgrading between participating enterprises or countries. Subsequently, Shepherd (2021) analyzed GVCs' evolving nature in the post-COVID-19 era and highlighted the need to formulate adaptive trade policies reflecting the reality of GVC trade.

To have a comprehensive understanding of GVC trade, the key is to consider its different components. Wang et al. (2017) offered an integrated framework for characterizing GVCs. They broke down gross exports into four components, namely domestic value-added (DVA) absorbed abroad, domestic value-added value (RDV) exported for the first time but eventually returned home, foreign value-added value (FVA), and pure double counting (PDC).

Their method separated traditional trade, simple GVC trade and complex GVC trade, thus making a more detailed analysis of GVC participation. Through the application of the framework, researchers and policymakers could deeply understand NZ's integration into the global production networks and its potential for promoting economic upgrading in GVCs.

### **2.1.2 Measurement of GVC participation**

Researchers and policymakers have generally faced a challenge of measuring GVC participation. Johnson and Noguera (2017) considered that traditional trade statistics to measure gross exports may result in double counting and fail to reflect the true nature of value creation in GVCs. To this end, some researchers have developed new measures to better quantify the participation of GVCs.

For example, Koopman et al. (2014) proposed a comprehensive framework to break down gross exports into a variety of value-added components (such as DVA, FVA, etc.). The framework has been adopted widely and become the foundation for the OECD's TiVA database and some other databases. The GVC Participation Index is another important measure, which combines backward and forward participation (Kowalski et al., 2015). The index indicates a country's GVC participation more comprehensively. The mathematical formulas for these measures are shown below:

$$BP = FVA / GX$$

$$FP = DVX / GX$$

$$\text{GVC Participation Index} = BP + FP = (FVA + DVX) / GX, \text{ where } GX \text{ is Gross Exports.}$$

Each of the above measure can gain different insights into a country's participation in GVCs. Among them, BP and FP study the import and export aspects of GVC participation respectively, while GVC Participation Index combines both aspects. In this way, a country's position and role in GVCs can be understood comprehensively.

### **2.1.3 Benefits and challenges of GVC participation**

GVC participation is beneficial for both countries and enterprises. It helps increase productivity, create jobs, and decrease poverty. Taking Vietnam for instance, after its integration into GVCs of electronic products, it largely increased formal employment, the number of jobs in the electronics industry, and the average wages (World Bank, 2020). For developing countries, GVCs can provide opportunities for industrial upgrading and access to global markets (Gereffi, 2014). A notable example is Costa Rica's successful entry into the medical devices GVC, which began with basic disposable devices and progressed to more sophisticated products, resulting in medical devices becoming the country's top export by 2015 (Bamber & Gereffi, 2013).

However, GVC participation also presents challenges. Baldwin (2012) argued that the rise of GVCs has led to a "second unbundling" of globalization, where competition occurs at the level of stages or tasks rather than finished products. This can lead to job displacement in developed countries and concerns about the "middle-income trap" for developing countries (Rodrik, 2018). In the NZ context, the dairy industry provides an illustrative example. While NZ has successfully positioned itself in the global dairy value chain, there are concerns about overreliance on commodity exports and the need to move up the value chain. A report by the New Zealand Productivity Commission (2024b) highlighted that despite being a major dairy exporter, NZ captures a relatively small share of the total value in the global dairy chain, with most of the value being added in downstream processing and marketing activities carried out in other countries. This exemplifies the challenge of upgrading within GVCs and avoiding the "middle-income trap" even for developed economies (such as NZ, etc.).

### **2.1.4 GVC participation of small open economies**

For small open economies like NZ, effective participation in GVCs is crucial for economic growth and development. van der Marel (2015) argues that small economies can benefit from specialization in niche areas within GVCs, leveraging their comparative advantages.

However, they also face challenges such as limited domestic market size and potential vulnerability to external shocks.

For small open economies like NZ, effective participation in GVCs is crucial for economic growth and development. However, they also face some unique challenges. The first is vulnerability to external shocks. NZ's economy is sensitive to GDP shocks from major trading partners like China and Australia, stemming from concentrated trade relationships and integration into global supply chains (McKenzie, 2024). The second is geographic isolation. NZ's position as "the last bus stop on the planet" creates logistical challenges and higher costs for participating in GVCs, particularly for time-sensitive products (New Zealand Productivity Commission, 2024b). The third is limited domestic market size. This constrains economies of scale and can make it difficult to attract foreign investment in some sectors (Hawke, 2014). The fourth is dependency on key sectors. NZ's economy relies heavily on a few major export industries, such as dairy, potentially increasing vulnerability (Hawke, 2014). The fifth is supply chain disruptions. Recent global events have exposed risks in extended international supply chains (New Zealand Productivity Commission, 2024b). The last is competition for value-added activities. There is a trend towards locating higher value-added activities closer to end markets rather than raw material sources, which can challenge NZ's position in GVCs (Hawke, 2014).

Despite these challenges, small economies like NZ can benefit from specializing in niche areas within GVCs, leveraging their comparative advantages in areas (such as agricultural products and food processing, etc.). Effective policies to enhance connectivity, diversify trade relationships, and build resilience are crucial for maximizing the benefits of GVC participation (New Zealand Productivity Commission, 2024b).

## **2.2 Digitalization**

### **2.2.1 Definition of digitalization**

Digitalization refers to the integration of digital technologies (such as artificial intelligence, blockchain, cloud computing, etc.) into various aspects of business and society, transforming processes, operations, and interactions (Brennen & Kreiss, 2016). Verhoef et al. (2021) defined digitalization as the integration of digital technologies into everyday life and business processes. It goes beyond mere digitization (converting analog information into digital form) to fundamentally change how value is created and captured. Digitalization encompasses a wide range of technologies, including but not limited to artificial intelligence, big data analytics, cloud computing, Internet of Things (IoT), and blockchain.

### **2.2.2 Measurement of digitalization**

In the existing literature, there are some methods for measuring digitalization, each of which has its advantages and limitations. The Internet penetration rate, broadband access, mobile phone subscriptions, and enterprises' digital technology adoption rates are several commonly used indicators (OECD, 2019). Relatively, the World Bank's Digital Adoption Index (DAI) and the European Commission's Digital Economy and Society Index (DESI) are two more comprehensive indicatives. They try to reflect the multifaceted nature of digitalization in different sectors (European Commission, 2021; World Bank, 2020).

Several key issues might complicate the digitalization measurement. First, technology is changing rapidly, which poses a challenge to the development of consistent long-term measurements. Secondly, there are differences between different sectors or countries. The impact and adoption of digital technologies vary significantly across different industries and economies, making standardized measurement difficult. The third is intangible nature of digital assets. Many digital assets and services are intangible, making their value and impact hard to quantify using traditional economic measures. The fourth is data gaps. There's often a lack of comprehensive and comparable data, especially for developing countries and

emerging technologies. The fifth is quality vs. quantity. Metrics often focus on the quantity of digital adoption (such as the number of Internet users, etc.) rather than the quality or effectiveness of use. The last is privacy and data access issues. The proprietary nature of much digital data can limit researchers' ability to accurately measure digital activities. These challenges highlight the need for ongoing refinement of measurement methodologies and the development of more nuanced, multidimensional approaches to assessing digitalization and its impacts on GVCs and broader economic activities (Bukht & Heeks, 2017; UNCTAD, 2019). For countries like NZ, ensuring widespread digital adoption across the economy is crucial for maintaining competitiveness in GVCs.

## **2.3 Trade agreements**

### **2.3.1 Evolution of trade agreements**

Trade agreements have evolved significantly over the past few decades, reflecting the changing nature of international trade and the global economy. Traditionally, trade agreements focused primarily on reducing tariffs and quotas, aiming to increase market access for goods across borders (Baldwin, 2019). However, the landscape of trade agreements has shifted dramatically, particularly with the rise of bilateral and regional trade agreements (RTAs). The proliferation of RTAs can be largely attributed to the challenges faced in multilateral trade negotiations under the WTO. The Doha Development Round, launched in 2001, faced persistent deadlocks, prompting many countries to seek alternative avenues for trade liberalization (Krugman, 2015). The transition to bilateral and regional agreements enables countries to pursue deeper integration and solve problems outside the scope of WTO negotiations.

The number of RTAs has increased substantially over the past few decades, especially since 2001 (see Figure 2.1). At present, 373 RTAs are in force (WTO's Regional Trade Agreements Database, 2024). These RTAs have expanded in both geographical coverage and depth of commitments. Modern RTAs often include provisions on services, investment, intellectual

property rights, e-commerce, and labor and environmental standards (Horn et al., 2010). Rising non-tariff barriers, demanding more comprehensive rules governing cross-border economic activities, and the rise of the digital economy has caused the shift towards deeper agreements (Rodrik, 2018).

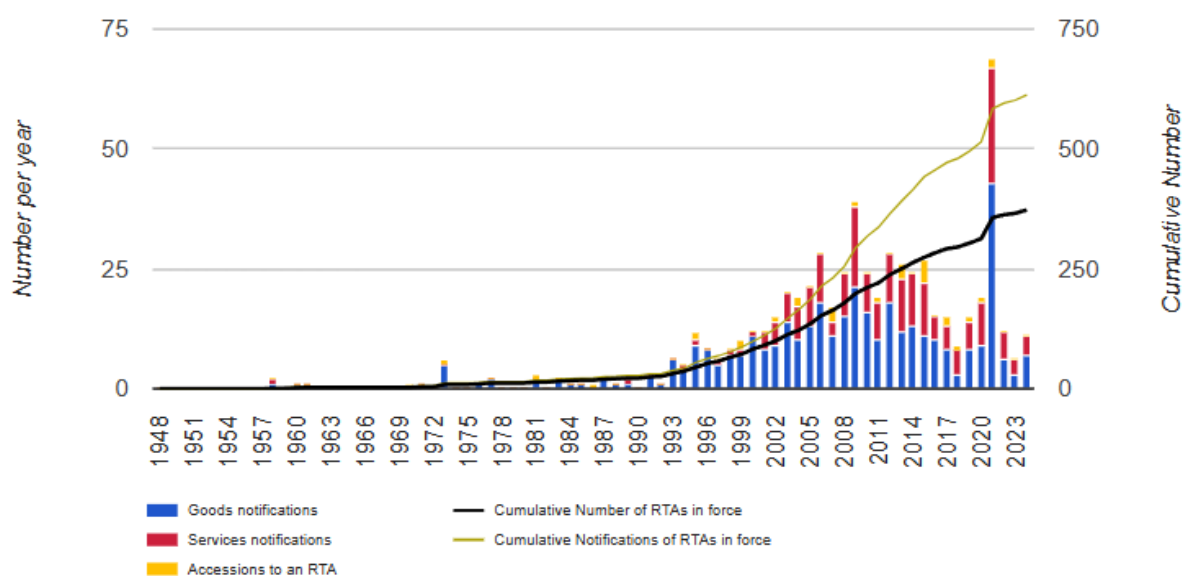


Figure 2.1: RTAs currently in force (by year of entry into force), 1948-2024  
(WTO's Regional Trade Agreements Database, 2024)

These deep trade agreements aim to create a more integrated and harmonized regulatory environment for international trade and investment. These agreements usually contain provisions for mutual recognition of standards, regulatory cooperation, and dispute settlement mechanisms. As two typical examples of deep agreements, the CPTPP and the United States-Mexico-Canada Agreement (USMCA) involve a wide range of issues related to trade (Bown, 2017). Whereas, Dür et al. (2014) argued that the evolution to deeper agreements has also triggered a debate about the impacts of these agreements on regulatory autonomy, national sovereignty, and the balance between trade facilitation and other public policy objectives. With the continuous development of trade agreements, finding this balance is still a major challenge for policymakers and negotiators.

### **2.3.2 NZ's approach to trade agreements**

As a small open economy, NZ has been actively seeking to reach a trade agreement to solve modern trade problems and strengthen its global economic integration. Several key factors have driven its attitude towards trade agreements. The first is the economic necessity. With a small domestic market, NZ relies heavily on international trade for economic growth. RTAs provide improved market access and help diversify export markets (New Zealand Foreign Affairs & Trade, 2024). The second is strategic positioning. New Zealand Foreign Affairs & Trade (2024) holds that RTAs enable NZ to enhance its political and economic ties with major partners and regions. The third is the modernization of trade rules. NZ looks for formulate international trade rules to show modern business practices and meet emerging challenges (New Zealand Foreign Affairs & Trade, 2024).

NZ's inclusion of digital trade in its RTAs demonstrates its understanding of the digital economy as the main driver of future economic growth and its desire to set international rules in the rapidly developing field. This strategy is consistent with NZ's broader goal of positioning itself as an innovative and technologically advanced economy in global markets.

## **2.4 Impact of digitalization on GVC-led trade**

### **2.4.1 Reshaping GVC structures**

Digitalization is reshaping the structure and governance of GVCs fundamentally. Through systematic literature review, Strange and Zucchella (2017) found that Industry 4.0 technologies make production networks more decentralized and flexible, and has the potential to decrease power asymmetries in traditional GVC structures. Through qualitative case study analysis of 3D printing impacts on GVCs, Rehnberg and Ponte (2018) considered that 3D printing causes the reconfiguration of GVCs, which may shorten supply chains and achieve more localized production. This might largely affect NZ and some other countries and reduce the disadvantages related to geographical isolation.

In view of the above insights, Li et al. (2024) offered empirical evidence on the impacts of digital technologies on the position of countries in GVCs. By using a comprehensive approach, their research contained panel data from 64 countries between 2000 and 2018, including both developed and developing economies participating in GVCs. They considered the GVC position and participation indexes as dependent variables, and the adoption of digital technologies as independent variables. Meanwhile, some control variables were also considered, such as GDP per capita and trade openness. They believed that the adoption of digital technologies usually enhanced a country's position in GVCs, especially in forward GVC participation. The impacts of digital technologies on the position of GVCs varied according to the specific types of technologies. Compared with communication technology, information technology had a greater positive impact on the position of GVCs. The relationship between digital technologies and the position of GVCs was moderated by human capital, institutional quality and a few other factors. For countries with higher levels of human capital and better institutions, they were likely to get more benefits from digital technologies in improving their position in GVCs. Moreover, along with countries' increasing inclusion of digital provisions in trade agreements, it is crucial to learn how these provisions carry out interactions with the adoption of digital technologies, thus affecting the positioning of GVCs.

Moreover, Gopalan et al. (2022) offered empirical evidence at the level of enterprises, and found that digitalization can significantly increase the participation of GVCs. In their research, the dependent variable was GVC participation; the independent variable was digital adoption; and control variables were mainly institutional quality, trade openness, GDP growth, and human capital development. By utilizing panel data on more than 2,000 enterprises in emerging economies between 2006 and 2016 from the OECD's TiVA database, World Bank Enterprise Surveys and ITU Database, they considered that for every additional standard deviation in digital adoption, GVC participation could increase by 12%. This impact is especially obvious for the medium and high-tech manufacturing industries.

Shepherd and Prakash (2023) supported the above research findings. Through a comprehensive analysis of the adoption of digital technology and GVC participation in 62 countries, they determined three key channels for digitalization to promote GVC participation, namely increasing coordination efficiency, reducing communication costs, and strengthening product traceability.

As far as NZ is concerned, the above insights show that digital technologies provide opportunities to handle geographical isolation and strengthen GVC participation, but the country needs to take a holistic approach that considers institutional quality, human capital development, and industry-specific strategies.

#### **2.4.2 Changing trade in services**

Digitalization is changing service trade profoundly, which is a significant part of GVCs. The change is reshaping the nature of international trade-enabled services and the way they are offered.

Baldwin (2019) proposed the concept of telemigration, that is, digital technologies make remote workers offer cross-border services. It breaks down geographical barriers and builds global markets for different types of services. For example, NZ's software developers can carry out projects for enterprises in Silicon Valley; and financial analysts can also serve enterprises in London. The impacts of this transformation are huge. For NZ, telemigration may bring new opportunities to service GVCs. It enables NZ's highly skilled workforce to participate actively in global projects, which makes it possible to deal with some restrictions that geographical isolation brings about (OECD, 2022).

Besides realizing the remote delivery of existing services, digitalization also brings new types of tradeable services. For instance, cloud computing enables enterprises to obtain computing resources from suppliers worldwide on demand. The development of digital platforms has

also created social media management, application development and some other new service industries (WTO, 2021).

Moreover, the development of digital service trade has also blurred the boundaries between products and services. Many physical products are now bundled with digital services, which is called servicification in the manufacturing industry. Miroudot and Cadestin (2017) considered that agricultural machinery made in NZ may come with a digital service package for remote monitoring and predictive maintenance. But meanwhile, it should be noticed that such transformation may also result in several challenges (such as cross-border digital service supervision, cybersecurity, etc.) (Ferracane et al., 2018).

Hence, it is vital for NZ to adapt to the changing situation of trade in services. This requires investing in digital infrastructure and skills, and participating in trade negotiations to solve unique problems of trade in digital services. NZ's participation in DEPA and other agreements is a critical step (New Zealand Foreign Affairs & Trade, 2023).

### **2.4.3 Data flows and value creation in GVCs**

In recent literature, some scholars have studied the importance of data flows in GVCs, which demonstrates digitalization' significant impacts on international trade and production networks.

According to Manyika et al. (2016), cross-border data flows have become an important source of global economic value creation. In 2014, data flows occupied \$2.8 trillion of global GDP, surpassing the impact of global trade in goods. Based on this, Lund and Manyika (2019) believed that data flows bring about a new form of globalization and digital globalization brings chances for countries and enterprises to participate in the global economy.

Data flow governance in FVCs is another important research field. Aaronson and Leblond (2018) considered that there are some large differences between countries in treating data governance in trade agreements. The U.S. tends to handle data flows in a more open way, while the EU pays more attention to data protection and privacy. These differences largely affect on the way for data-driven GVCs create and distribute value. From a policy point of view, Casalini and López González (2019) believed that it is necessary to strike a balance between promoting data flows and realizing other policy objectives (such as cybersecurity, etc.).

As far as NZ is concerned, these developments bring both opportunities and challenges to it. The increasing significance of data flows enables NZ to deal with some restrictions caused by geographical isolation. However, careful policy considerations are also needed to guarantee that NZ obtains value from GVCs driven by the data, while protecting its interests in digital sovereignty, data privacy and other fields.

## **2.5 Impact of trade agreements on GVC-led trade**

### **2.5.1 Facilitating GVC expansion**

Trade agreements can reduce trade barriers and establish more predictable business environments, thus promoting the expansion of GVCs. Orefice and Rocha (2014) collected bilateral trade data from 185 countries between 1980 and 2007, and used a gravity model. They measured the degree of vertical specialization by the share of FAV in exports, and replaced the depth of trade agreements with the number of policy areas involved in the agreements. They found that deep trade agreements have something to do with vertical specialization and increased participation in GVCs. Additionally, Sawada et al. (2020) stressed the important role of digital trade provisions in modern trade agreements, and empirically studied the impact of trade agreements on GVC participation in the Asia-Pacific region. By carrying out econometric analysis of 25 Asian economies in the period 2000-2018, they found that the comprehensive trade agreements increased backward participation (BP)

in GVCs by 8.6% and forward participation (FP) by 6.2%. Generally, trade agreements facilitate GVC expansion through the following mechanisms:

The first is tariff reduction. Though the input-output analysis using value-added trade data during 1970 and 2009, Johnson and Noguera (2017) considered that by lowering or eliminating tariffs, trade agreements can reduce the cost of intermediate goods crossing borders multiple times within GVCs. This is particularly critical for GVCs, where even small tariffs can compound significantly across multiple border crossings.

The second is non-tariff barrier reduction. By carrying out cross-country regression analysis of World Bank survey data between 1990 and 2014, Osnago et al. (2016) considered that modern trade agreements increasingly focus on reducing non-tariff barriers (such as harmonization of product standards and regulations, streamlining customs procedures and border controls, etc.), which are often more significant obstacles to GVC trade than tariffs.

The third is services liberalization. Many trade agreements include provisions for services trade liberalization, which is crucial for GVCs as services are often embedded in manufactured goods (Miroudot & Cadestin, 2017).

The fourth is intellectual property rights (IPR) protection. Strong IPR provisions in trade agreements can facilitate technology transfer within GVCs, particularly important for knowledge-intensive industries (Maskus & Saggi, 2018). They also conducted a comprehensive review of theoretical and empirical literature on IPR and technology transfer in GVCs. They analyzed data from various sources, including WIPO and World Bank, covering the period 1990-2015. Although they found evidence that stronger IPR can facilitate technology transfer within GVCs, particularly in high-tech sectors, their study did not specifically address the interaction between IPR, digitalization, and GVC participation in small open economies like NZ. This gap aligns with RQs of this study, particularly RQ2 and RQ3,

which seek to understand how digitalization and trade agreements impact NZ's GVC participation.

However, challenges remain. The effectiveness of trade agreements in facilitating GVCs can be limited by the rules of origin complexity that can hinder the flexibility needed in GVCs, insufficient attention to behind-the-border barriers in some agreements, and uneven implementation and enforcement of agreement provisions (Conconi et al., 2018).

For NZ, agreements like the CPTPP can potentially enhance access to key markets and production networks in the Asia-Pacific region. For example, in the dairy industry, CPTPP provides new quota access for butter, cheese and milk powders in Japan, Canada and Mexico. By Year 10, this could grow to over 100,000 tonnes of new quota access across these markets, allowing NZ dairy exporters to expand their participation in regional dairy value chains (New Zealand Foreign Affairs & Trade, 2018). However, the actual impact depends on how effectively businesses can leverage these agreements. The TAPED data shows that NZ's approach to digital trade provisions has evolved over time, becoming more comprehensive and targeted. Compared to many of its trading partners, NZ tends to push for more open digital trade regimes, reflecting its position as a small, open economy reliant on digital connectivity. However, there are variations across agreements. DEPA represents the most comprehensive approach, while agreements with partners more cautious about data flows (such as the EU, etc.) tend to have more qualified commitments. This evolving approach reflects NZ's strategy to position itself advantageously in the digital economy while balancing concerns about data protection and digital sovereignty. The challenge moving forward will be to maintain consistency across agreements while adapting to the rapidly changing digital landscape and diverse partner preferences.

### **2.5.2 Addressing digital trade barriers**

Modern trade agreements increasingly include provisions aimed at addressing barriers to digital trade. By conducting content analysis of digital provisions in RTAs during 2000 and 2019, Burri and Polanco (2020) analyzed digital trade provisions in recent trade agreements, finding a trend towards more comprehensive and binding commitments. The provisions may promote the development of e-commerce, cross-border data flows and other aspects of GVC trade.

Through an empirical study, van der Marel and Ferracane (2021) pointed out that restrictive data policies are related to reduced imports of data-intensive services, which indicates the significance of resolving the barriers through trade agreements. Wu (2017) believed that the digital trade provisions in TPP and other agreements are new paradigms of trade governance and solve data localization, cybersecurity and other problems. The provisions establish more favorable environments for the participation of digital GVCs. However, Mitchell and Mishra (2020) argued that it is significant to balance promoting digital trade with realizing other policy goals (such as protecting privacy security, etc.). countries should take innovative ways to solve the competing problems in future trade agreements. By comprehensively studying New Zealand-ASEAN digital trade between 2000 and 2023, Honey Consulting (2024) pointed out that enterprises are faced with some challenges on data regulation and digital trade barriers, as well as some other major barriers (such as frictions caused by inconsistent payment methods, challenges to conduct government procurement, etc.). The results were particularly important for NZ, which is trying to expand its digital trade presence in Southeast Asia through by trade agreements, digital economic partnerships and other means.

### **2.5.3 Regulatory harmonization and GVCs**

Trade agreements facilitate regulatory coordination and reduce non-tariff barriers that may divide GVCs. According to Hoekman (2015), regulatory cooperation provisions in trade agreements contribute to shorten the regulatory distance between countries and further

promote the integration of GVCs. Regulatory coordination in trade agreements takes a variety of forms (such as mutual recognition standards, comprehensive coordination of regulations, etc.) (Stender et al., 2021). This is vital for GVCs, because the differences in regulations between countries could greatly increase transaction costs and break up the production networks (Eckhardt & Poletti, 2018). Some empirical evidences have also proved the significance of unified regulation for GVCs. For example, Fontagné et al. (2015) pointed out that the regulatory cooperation provisions in trade agreements can positively affect the trade of intermediate products. The research by Baccini et al. (2018) also indicated that deep trade agreements that usually contain regulatory cooperation provisions could increase the trade in parts.

However, it is challenging for the achievement of effective regulatory coordination. Young (2015) considered that domestic regulatory preferences and institutional structures could impede coordination efforts. Kong and Chen (2022) believed that too rigid coordination may stifle innovation and regulatory experiments. Despite these challenges, the role of regulatory coordination in trade agreements may become increasingly important along with the increasing complexity and global fragmentation of GVCs.

## **2.6 Summary**

This chapter carried out critical review of the literature related to GVCs and GVC led trade, digitalization, trade agreements, impact of digitalization on GVC led trade, as well as the impact of trade agreements on GVC led trade. Existing studies showed that trade agreements can largely affect the participation and structure of GVCs. Tariff cuts and preferential market access provisions are still essential elements to promote the cross-border flow of intermediate products and services. Whereas, the impacts of the traditional measures are supplemented by more complex provisions. Rules of origin, while necessary to prevent trade deflection, can sometimes hinder GVC efficiency, highlighting the need for careful calibration in trade negotiations. In addition, trade facilitation measures have emerged as

crucial elements in reducing transaction costs and enhancing GVC integration. Similarly, provisions addressing digital trade barriers have become increasingly important as GVCs become more reliant on data flows and digital services. The chapter also highlighted the significance of regulatory harmonization efforts in trade agreements, which can reduce non-tariff barriers and facilitate smoother operation of cross-border production networks. However, the research also notes potential tensions between investment protection and host countries' regulatory autonomy. Despite the wealth of research in this field, several important gaps remain. There is a notable lack of long-term empirical studies on how deep trade agreements affect GVC upgrading, particularly for small, open economies (such as NZ, etc.). The interaction between different types of provisions in trade agreements and their combined impact on GVCs is an area that requires further investigation. Additionally, there is insufficient research on how trade agreements can be optimized to promote sustainable and inclusive GVC participation, especially for SMEs and developing countries. Hence, this study could fill in these gaps in research by studying the impact of digitalization and trade agreements on NZ's trade involving GVCs.

### **Chapter 3: Methodology**

The aim of this chapter is to identify and justify the research methodology and methods for this study from four aspects, namely overall research design, data collection, data analysis techniques, as well as limitations and ethical considerations.

#### **3.1 Overall research design**

On the whole, this study took a mixed-methods approach that combined quantitative analysis of NZ's trade and economic data with qualitative content analysis of its trade agreement provisions. With such design, the complex interaction between NZ's digitalization, trade agreements and GVCs could be examined comprehensively (Creswell & Plano Clark, 2017). The quantitative analysis offered empirical evidence for the evolution of NZ's GVC participation and digitalization's impacts; and qualitative analysis gained insights into how trade agreements integrate digital elements to promote NZ's GVC trade.

There were several main reasons for choosing a mixed-methods approach. First, this approach helped understand the complex relationships between digitization, trade agreements and GVC participation deeply and comprehensively. Secondly, this approach contributed to an in-depth understanding of specific developments in NZ. Through the combination of relevant existing literature with quantitative analysis, this study gained policy-relevant insights on the impacts of digitalization and trade agreements on NZ's GVC-led trade. Thirdly, this approach could triangulate the research results through multiple sources of data, thus improving their reliability and validity (Creswell & Creswell, 2022). This is crucial when studying a relatively new and rapidly developing phenomenon, such as the impact of digitization on global value chain-led trade.

Moreover, an explanatory sequential design was adopted in this study (Creswell, 2014). That is, the researcher first made quantitative data analysis, and then carried out qualitative content analysis. Next, the researcher integrated all research results to understand the

research questions comprehensively. In this way, such design enabled qualitative analysis to be based on quantitative results, to improve their breadth and depth (Ivankova et al., 2006).

## **3.2 Data collection**

### **3.2.1 Quantitative data collection**

This research depended largely on secondary quantitative data mainly on NZ's trade, economy and technologies in a variety of authoritative databases. It analysed trade flows of goods and services (Stats NZ and World Bank WITS), TVA indicators (OECD TiVA), digital economic indicators (OECD and ITU), foreign investment statistics (UNCTAD), and digital trade provisions in RTAs (TAPED), mainly during the period of 2011-2020.

Among them, the TiVA database offered some important GVC indicators (such as forward and backward GVC participation, DVA content of exports, etc.). The TAPED database provided an integrated mapping and coding of preferential trade agreements, involving provisions, chapters, and annexes that regulate digital trade in a direct or indirect way. It is important for this study to analyze the incorporation of NZ's trade agreements into the digitalization elements, to promote GVC-led trade (University of Lucerne, 2024).

In addition, this study also made use of the APTIAD, which offered rich data on Asia-Pacific trade agreements. It helped to analyze regional integration patterns and track the evolution of digital trade provisions in the Asia-Pacific trade agreements involving NZ. Meanwhile, APTIAD provided detailed data on the scope, coverage and implementation status of relevant trade agreements, which complemented other data sources and provided a regional perspective for the development of trade agreements (APTIAD, 2024).

### **3.2.2 Qualitative data collection**

The systematic literature review followed the rigorous procedures outlined by Pickering and Byrne (2014), synthesizing theoretical and empirical literature on digitalization, trade

agreements, and GVC participation. This approach helped identify key trends, gaps in current knowledge, and provide a robust conceptual framework for the study. The review encompassed both global perspectives (such as Adarov & Stehrer, 2021; Baldwin & Lopez-Gonzalez, 2015; etc.) and NZ-specific research (such as Inomata & Todorov, 2020; etc.).

The qualitative data for this study consisted of the text of NZ's trade agreements that include provisions related to digitalization and GVCs. As identified in Chapter 1 (Table 1.1), these agreements included the CPTPP, DEPA, the NZ-UK FTA, the NZ-EU FTA, and the AANZFTA Upgrade. The full texts of these agreements were obtained from the New Zealand Ministry of Foreign Affairs and Trade's (MFAT) website (New Zealand Foreign Affairs & Trade, 2024).

### **3.3 Data analysis techniques**

#### **3.3.1 Quantitative analysis techniques**

This study adopted some quantitative analysis techniques to solve the research questions. Descriptive statistics and trend analysis were used to examine changes in NZ's GVC participation over time and its relationship to digital adoption and trade agreement implementation. Key GVC-related indicators from the OECD Data Explorer and the TiVA 2023 report for NZ were analyzed to track the evolution of NZ's GVC participation (OECD, 2023). Scatter plots and correlation analysis examined potential relationships between digital adoption indicators (i.e., Internet penetration rate and ICT use index) and GVC participation indicators (i.e., NZ's total trade of GDP, GVC participation index, as well as forward and backward linkages). This approach was based on Wang et al.'s (2017) comprehensive measure of GVC participation. Moreover, this study used data visualization techniques to display NZ's evolution of GVC participation, trade relations and technology adoption (Kowalski et al., 2015)<sup>2</sup>.

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<sup>2</sup> No econometric analysis will be carried out here given the short timeframe required of the dissertation.

### **3.3.2 Qualitative analysis techniques**

For qualitative data analysis, this study adopted content analysis as a systematic qualitative methodology to study provisions on the NZ's trade agreements that were relevant with its digitalization and GVCs. Following Krippendorff's (2018) conceptualization of content analysis as a research technique for making replicable and valid inferences from texts to contexts, this study systematically analyzed the content and structure of relevant trade agreements. By learning from Burri and Polanco's (2020) methodology for analyzing digital trade provisions in RTAs, the analysis adopted a structured approach, involving developing a clear coding scheme, checking the reliability between encoders, and extracting structured data. This process included the systematic coding of specific provisions related to digital trade, data flows and GVC facilitation in agreements (such as CPTPP, DEPA, NZ-UK FTA, NZ-EU FTA, the AANZFTA Upgrade, etc.). This study determined several key themes, mainly including e-commerce chapters, paperless trading, electronic authentication, cross-border data flows, as well as intellectual property protections that facilitate digital trade and GVC participation. Through this methodical approach, this study could carry out rigorous qualitative assessment of how trade agreements integrate digital elements to promote NZ's participation in GVCs. Additionally, this study also integrated the results of content analysis with quantitative analysis results to fully understand the impacts of digitalization and trade agreements on NZ's GVC-led trade. This helped to give full play to the advantages of the two methodologies and have a more detailed understanding of research questions (Fetters et al., 2013). This comprehensive analysis method was especially important for studying the complex interrelationships between NZ's digitization, trade agreements and participation in GVCs.

### **3.4 Limitations and ethical considerations**

This study depended heavily on secondary data sources, which was a major limitation. This may result in measurement inconsistencies. In addition, this study laid emphasis on some specific trade agreements, which might not comprehensively reflect the digital trade

provisions in all NZ's trade relations. Furthermore, the quality of qualitative content analysis was largely determined by the researcher's explanations, which might affect the objectivity of this study (Bengtsson, 2016).

Ethical considerations were mainly associated with the responsible use and objective explanations for the collected data. During the process of conducting this study, the researcher complied with the principles of research integrity, involving objectivity, transparency, and accuracy in analyzing and reporting research results (ALLEA, 2017). Additionally, the researcher recognized the sources of the data clearly and disclosed possible limitations in the data.

## Chapter 4: Results and Discussion

With the collected secondary data from various sources, this chapter aims to analyse the evolution of participation in GVC led trade in the NZ economy, the impact of digitalization on NZ's participation in GVC led trade, and the role of trade agreements incorporated the elements of digitalization in facilitating GVC trade for NZ. On this basis, the results will be discussed through the combination of the literature reviewed in Chapter 2.

### 4.1 The evolution of participation in GVC led trade in the NZ economy

This study presents a comprehensive overview of data related to NZ's digitalization, GVC participation, and relevant trade agreements. It will analyze several key GVC-related indicators by mainly using data from the OECD Data Explorer and the TiVA 2023 report for NZ (OECD, 2023).

#### 4.1.1 NZ's digitalization

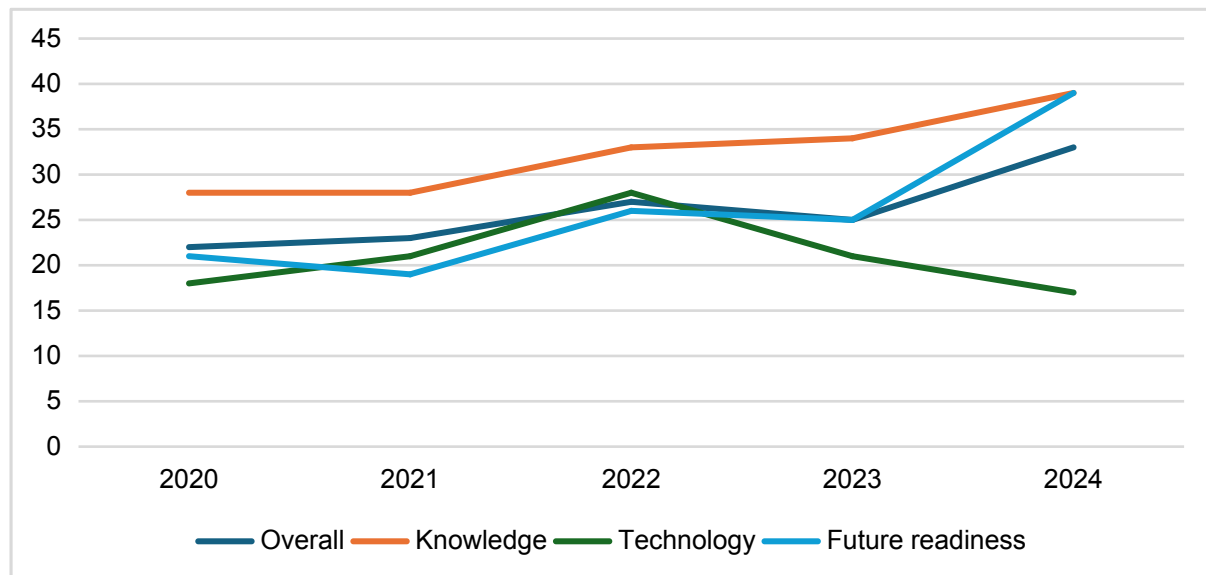


Figure 4.1: NZ's digital competitiveness ranking, 2020-2024  
(IMD, 2024)

NZ has made significant strides in digitalization over the past decade, recognizing its importance for economic growth and global competitiveness. Government initiatives and

private sector innovation have jointly promoted NZ's digital transformation. As an index that is released by International Institute for Management Development (IMD) World Competitiveness Center, the IMD World Digital Competitiveness Ranking (WDCR) is based on the ability of countries to use digital technologies to improve competitiveness. It is comprised of three major factors (i.e., knowledge, technology, and future readiness), each of which includes several sub-factors. Among these three variables, knowledge measures the know-how needed to discover, understand and build new technologies, containing talent, education and scientific concentration. Technology evaluates the overall context that facilitates the development of digital technologies, mainly involving technical infrastructure, regulatory frameworks and capital availability. Future readiness examines the degree of preparedness to utilize digital transformation, including IT integration, business agility and adaptive attitudes (IMD, 2024). WDCR considers both hard data and survey data, which is calculated by ranking countries according to the total scores through the aggregation of scores in each major factor and sub-factor (IMD, 2024). In the IMD World Digital Competitiveness Ranking, NZ ranks No.33 out of 67 countries in 2024. However, NZ's overall ranking in 2024 has hit a new low in the last five years, which was ever No.22 in 2020. The fall in NZ's digital competitiveness ranking was largely caused by a drop in its knowledge and future readiness rankings, while its technology ranking rose from No.28 in 2022 to No.17 in 2024 (see Figure 4.1) (IMD, 2024). In addition, NZ lags Singapore (No.1), Switzerland (No.2), Australia (No.15), and the United Kingdom (No.18), particularly in business agility and digital technology integration (IMD, 2024).

One major aspect of NZ's digitalization process is to improve its digital infrastructure. The NZ launched the Ultra-Fast Broadband program in 2009 to supply 87% of the population with high-speed Internet by 2022. As of 2023, the program had gone beyond its target; and 88% of New Zealanders could use fiber broadband (MBIE, 2024). Improved connectivity is essential to increase NZ's participation in GVCs, especially in the field of knowledge-intensive services.

NZ has made great progress in adopting digital technologies in enterprises, but it also encounters some challenges. According to the OECD's (2022) Digital Economy Outlook 2022, 98% of NZ enterprises had broadband connections, but only 47% of enterprises used cloud computing services and 23% used big data analytics. This shows that there is still room for improvement in the adoption of advanced digital technologies, which can increase productivity and participation in GVCs.

In addition, the NZ government has also actively established an environment that supports digital innovation. It launched the Digital Technology Industry Transformation Plan in 2019, which is dedicated to supporting the development of the technology industries and encouraging other industries to adopt digital technologies (New Zealand Tech, 2023). Moreover, it has also carried out the initiatives (such as the Digital Boost program, etc.) to provide small enterprises with resources and training to help improve their digital capabilities (MBIE, 2022). For instance, Grove Mill, a Marlborough-based wine producer, carried out the digital promotion program successfully to transform its business operations in 2021. It implemented an e-commerce platform and the cloud-based inventory management system, which helped it increase its sales by 45% and reduce its inventory management costs by 30%. The digital promotion program offered the company expert guidance, digital skills training, and some funding for technology applications (MBIE, 2022). This also reflected how government support could effectively promote the digital transformation of traditional industries.

Despite these advances, the challenges do exist. According to the Digital Skills Aotearoa report (2021), there is a huge skills gap in technology industries; and the demand for skilled workers exceeds the supply. Addressing this gap is crucial for NZ to fully leverage digital technologies in its global value chain participation.

### 4.1.2 NZ's GVC participation

NZ's GVC participation has taken place large changes in recent more than 20 years. As a small, open economy, NZ's ability to participate in GVCs is vital for its economic growth and global competitiveness. Its GVC participation can be generally measured through both backward participation in GVCs (i.e., foreign value added (FVA) content of gross exports) and forward participation in GVCs (domestic value added (DVA) in foreign final demand). Based on the latest OECD TiVA data on NZ, this study analyzes how NZ's GVC participation has evolved, which lays emphasis on its GVC participation trends over time and across different industries.

#### (1) Backward participation in GVCs

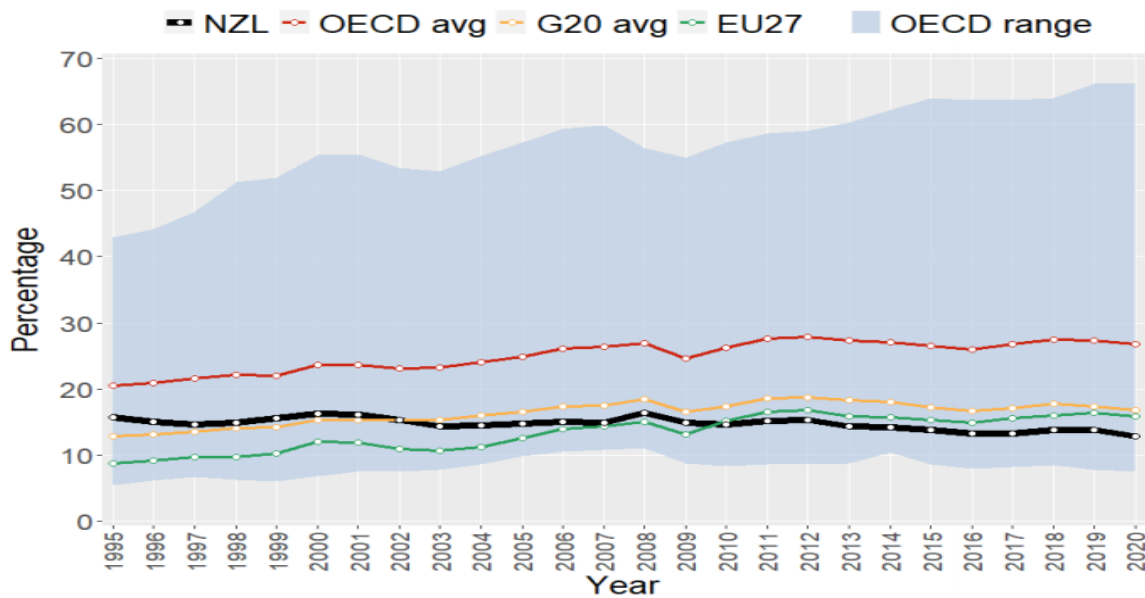


Figure 4.2: FVA content of gross exports, 1995-2020  
(OECD, 2023)

Analysis of TiVA data indicated large changes in NZ's FVA content of gross exports over the past 20 years. As shown in Figure 4.2, NZ's FVA content as a percentage of total gross exports demonstrated obvious fluctuations during 1995 and 2020. From 2003 to 2008, this indicator basically showed a steady increase trend, which reached 16.5% in 2008. However, the occurrence of the financial crisis led to a gradual decline in this indicator after 2008, which

was 12.8% in 2020. This was obviously lower than the OECD average of 26.7% (OECD, 2023). The persistent FVA gap shows NZ's geographic isolation, resource-based economic structure and dependence on primary product exports. The lower FVA content indicates that NZ faces challenges in integrating GVCs and industrial strategy specialization that helps keep its comparative advantages. This trend was consistent with the finding of Criscuolo and Timmis (2018), who observed similar patterns among small open economies adapting to global economic shocks.

The moderate FVA content reflects both NZ's geographic isolation and its economic structure, which emphasizes primary production and services over manufacturing (New Zealand Productivity Commission, 2024). This pattern is in line with the research by López González and Jouanjean (2017), who considered that geographic distance continues to influence GVC participation patterns, particularly for countries distant from major manufacturing hubs. This level of FVA content implies a strategic balance between global integration and economic resilience, which is especially valuable in view of recent chaos in global supply chains (New Zealand Treasury, 2022). NZ's FVA content pattern indicates its success in specialization in some areas with comparative advantages (Zhang, 2009).

There are a few factors influencing NZ's relatively lower participation in GVCs, such as remote geographical location, small market size, high transportation costs, as well as limited infrastructure and domestic supply chain integration. According to New Zealand Treasury (2022), NZ's population is approximately 5.1 million, so the small domestic market limits economies of scale. This makes it hard to achieve the production volumes necessary for competitive participation in manufacturing GVCs. NZIER (2016) believed that the relatively small size of NZ's industrial base means fewer opportunities for domestic linkages within GVCs. This makes it difficult to develop dense networks of suppliers and specialized service providers that characterize successful GVC hubs.

## (2) Forward participation in GVCs

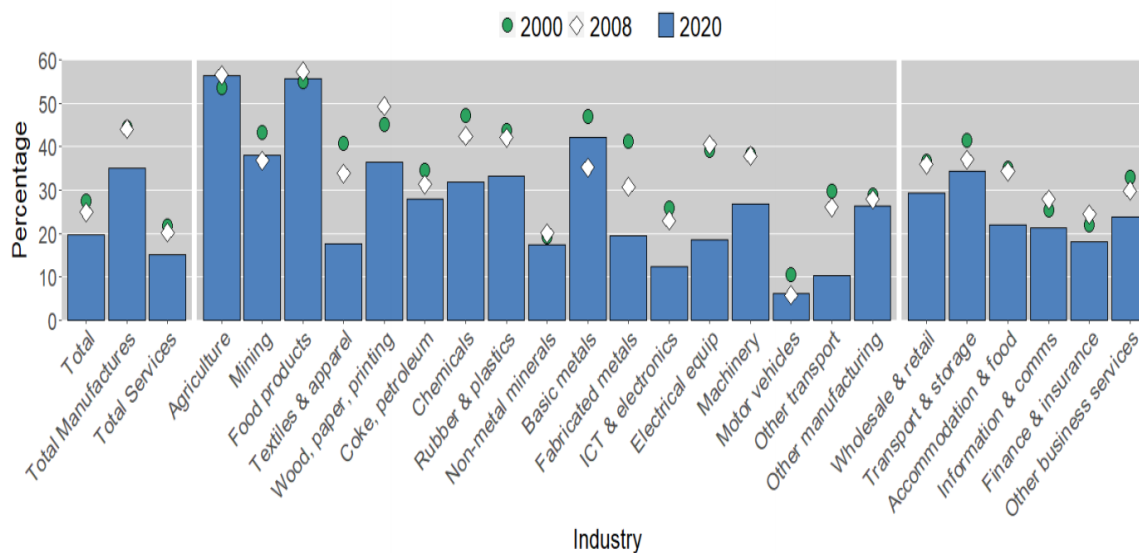


Figure 4.3: DVA in foreign final demand, by industry, 2000, 2008, and 2020

(OECD, 2023)

The DVA in foreign final demand uncovered varying patterns across industries, which reflected NZ's diverse integration into GVAs. From Figure 4.3, this indicator showed a declining trend between 2000 and 2020, from about 28% in 2000 to 19.7% in 2020. It was also significantly lower than the OECD average of 29.8% in 2020 (OECD, 2023). This relatively low forward GVC participation index implies that NZ's exports have a high domestic value-added content, indicating less reliance on imported intermediate inputs compared to many other countries. A significant portion of NZ's exports are likely primary products or finished goods, rather than intermediate products that feed into other countries' export production. For example, Fonterra provides milk powder as an intermediate input to food manufacturers across Asia. In 2020, about 65% of Fonterra's milk powder exports were used as ingredients in other countries' food production processes, particularly in infant formula manufacturing in China (OECD, 2023).

Additionally, the declining trend of NZ's forward participation in GVCs was in line with patterns observed in other small, open economies, reflecting both global economic shifts and

changing trade dynamics (The World Bank, 2023). This trend usually demonstrates the intensification of global market competition and the restructuring of the international supply chains (Criscuolo & Timmis, 2018). According to the New Zealand Productivity Commission (2024a), the downward trend may seem worrying, but it reflects to some extent the economic adjustment to higher-value activities and more complex supply chain relationships. In addition, the WTO (2023) believed that a lower DVA\_FFD ratio sometimes implies that the forms of GVC participation are more complex, especially in the case of an increase in high-value industries. Understanding this broader trend is crucial for contextualizing NZ's evolving position in global value chains and informing future trade and industrial policies.

### (3) Industry-specific GVC participation

By analyzing industry-specific GVC participation, this study reveals significant variations across NZ's economic sectors between 2000 and 2020.

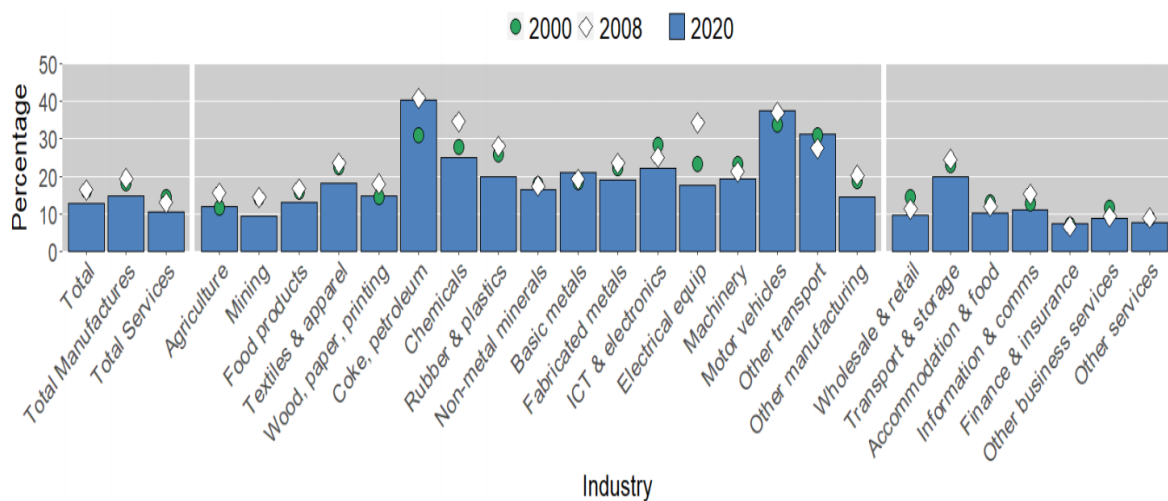


Figure 4.4: NZ's FVA content of gross exports by industry, 2000, 2008, and 2020 (OECD, 2023)

Figure 4.4 illustrates varying levels of FVA content of gross exports across industries, which offered additional insight into sectoral GVC participation. Coke and refined petroleum industries show relatively higher FVA content (40.2%), followed by Motor vehicles (37.4%)

and other transport equipment (31.1%) (OECD, 2023). This indicates that NZ has significant backward participation in GVCs in these industries. In comparison, NZ has lower backward participation in GVCs in mining, finance and insurance, and other services industries (OECD, 2023).

Figure 4.3 shows that the DVA in foreign final demand also indicates distinct patterns across different industries. Agriculture demonstrated the highest forward participation level (56.3%), followed by food products (including beverages) (55.6%) and basic metals (42%) (OECD, 2023). This indicates that NZ has relatively higher forward participation in GVCs in these industries. In contrast, NZ has lower forward participation in GVCs in Motor vehicles, other transport, and total services. Figures 4.3 and 4.4 revealed contrasting GVC participation patterns across NZ industries and over time. Figure 4.3 demonstrates NZ's strength as an upstream supplier of primary and processed raw materials, while Figure 4.4 shows NZ's downstream position in manufacturing sectors. Together, these findings demonstrated NZ's dual role in GVCs as an important provider of primary inputs while depending on imported components for manufacturing outputs.

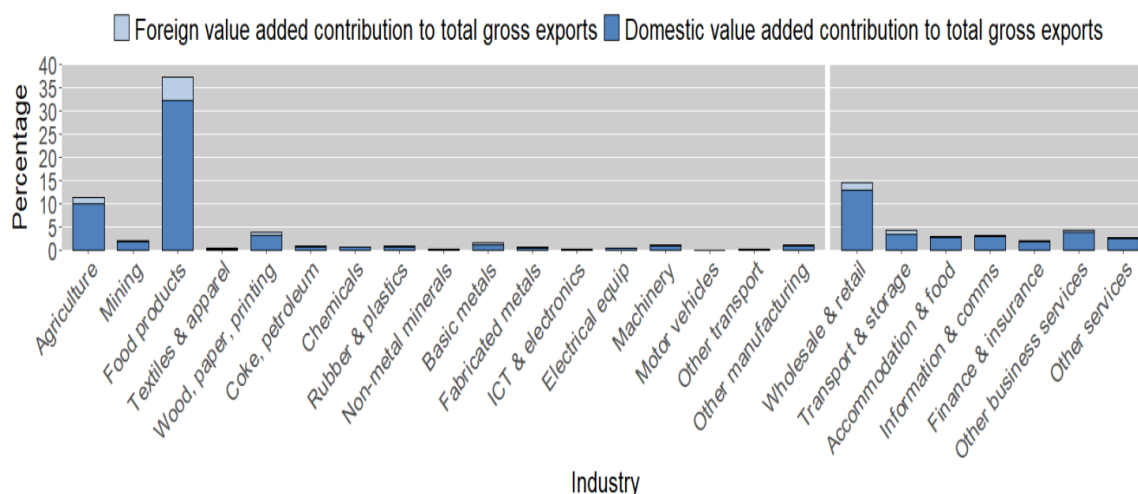


Figure 4.5: NZ's industry share of FVA and DVA content of gross exports, 2020 (OECD, 2023)

Moreover, Figure 4.5 reveals that food products (including beverages) dominated NZ's exports at 37% of total export value, which primarily consists of DVA. Wholesale and retail followed at approximately 15%, which also had a high DVA proportion. In addition, agriculture also generated greater sources of gross exports (OECD, 2023). Overall, NZ's export portfolio indicates strong domestic content in primary industries while exports of food products, wholesale and retail, and agriculture incorporate more foreign inputs, which reflects NZ's natural resource advantages.

According to the WTO's (2023) Global Value Chain Development Report 2023, these industrial patterns reflected broader global trends in GVC participation, where countries increasingly specialized in specific segments of value chains based on their comparative advantages. The New Zealand Treasury (2022) suggested that this specialization pattern helped maintain NZ's competitive position in global markets despite challenges posed by geographic isolation and market size.

#### (4) Trade partner relationships

According to OECD (2023), there were significant shifts in NZ's trade partner relationships within GVCs between 2000 and 2020. The most notable change has been China's emergence as NZ's dominant trade partner. As shown in Figure 4.6, China, Australia and the United States were the three most important export market destinations of NZ and the top three final destinations for its value added in 2020. At the same time, China, the European Union (including 27 countries), and Australia were NZ's top three import partners in both gross and value-added trade (OECD, 2023). This reflects both regional integration and participation in global networks. However, it is worth noting that NZ has not yet had a formal trade agreement with the United States. The data demonstrate that while NZ has achieved significant GVC participation, particularly in services and niche agricultural products, there is still room for deeper integration. The country's lower overall GVC participation compared to regional

averages suggests potential for growth, possibly through increased digitalization and leveraging of trade agreements.

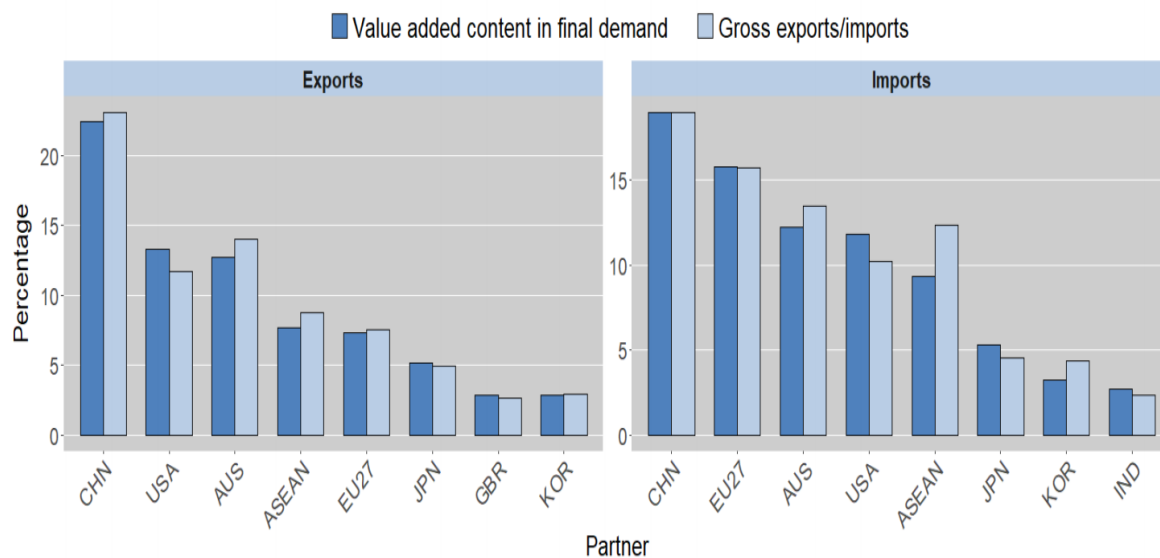


Figure 4.6: NZ's main trade partners in 2020  
(OECD, 2023)

The New Zealand Ministry of Foreign Affairs and Trade (2023) noted that this evolving pattern of trade relationships reflects successful diversification of trading partners while maintaining strong ties with traditional markets. Such diversification enhances resilience in GVCs. In addition, WTO (2023) held that NZ's growing integration with Asian value chains, particularly with China and ASEAN countries, positions it favorably within emerging regional production networks. This geographic reorientation of trade relationships has important implications for future trade policy and economic strategy.

#### 4.1.3 NZ's relevant trade agreements

NZ has been proactive in pursuing trade agreements that address modern trade issues, including those related to digitalization and global value chains. These agreements play a crucial role in shaping NZ's trade landscape and its participation in global value chains. As of 2023, NZ has a few RTAs in force, which are shown in Table 4.1.

Table 4.1: NZ's RTAs in force

RTAs	Time when RTAs were in force
NZ-Australia Closer Economic Relations (CER)	1983
NZ-Singapore Closer Economic Partnership <sup>3</sup>	2001
NZ-Thailand CER	2005
Trans-Pacific Strategic Economic Partnership (P4)	2006
NZ-China Free Trade Agreement (FTA)*	2008
ASEAN-Australia-New Zealand Free Trade Agreement (AANZFTA)*	2010
NZ-Malaysia Free Trade Agreement	2010
NZ-Hong Kong, China CEP	2011
Korea-New Zealand Free Trade Agreement (KNZFTA)	2015
Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)*	2018
The Pacific Agreement on Closer Economic Relations (PACER) Plus	2020
Digital Economy Partnership Agreement (DEPA)*	2021
Regional Comprehensive Economic Partnership (RCEP)*	2022
New Zealand - United Kingdom Free Trade Agreement*	2023
New Zealand - European Union Free Trade Agreement*	2024

(New Zealand Foreign Affairs & Trade, 2024)

The above agreements cover a large part of NZ's trade and demonstrate the country's commitment to open, rule-based trade (New Zealand Foreign Affairs & Trade, 2024). Its attitudes towards RTAs are closely related to its "trade for all" agenda, which is aimed at guaranteeing that trade agreements can bring benefits to all New Zealanders. The agenda contains some key elements, such as inclusive trade, sustainable development, stakeholder participation, labour rights, and transparency (New Zealand Foreign Affairs & Trade, 2024).

NZ has paid more and more attention to the inclusion of digital trade provisions in its RTAs over the years, which is reflected in its recent agreements. For instance, CPTPP contains

<sup>3</sup> New Zealand has multiple bilateral and regional trade agreements with the same trading partners. Agreements marked with an asterisk (\*) contain provisions addressing digital trade or have chapters including enforcement clauses related to digital trade. Some agreements (such as AANZFTA, etc.) have been recently updated to include digital trade provisions. The AANZFTA upgrade, signed in 2023, introduced a new chapter on Electronic Commerce, reflecting the growing importance of digital trade in the region.

special e-commerce chapters on data localization, cross-border data flow and consumer protection in the digital environment (MFAT, 2018). The DEPA signed by New Zealand with Chile and Singapore in 2020 is an independent digital agreement covering some digital economy issues (such as digital identity, digital inclusion, fintech, etc.) (MFAT, 2020). Additionally, the New Zealand-United Kingdom Free Trade Agreement contains comprehensive digital trade provisions to solve paperless trade, emerging technical cooperation and some other issues (New Zealand Foreign Affairs and Trade, 2024). Generally, these digital trade provisions can promote cross-border data flows, while protecting personal information, encouraging emerging technical cooperation, facilitating digital inclusion, and ensuring cybersecurity (New Zealand Foreign Affairs & Trade, 2024). In addition to new agreements, NZ has also prioritized upgrading existing agreements. The NZ-China FTA upgrade, signed in 2024, introduced new chapters on e-commerce and digital trade, enhancing provisions for cross-border data flows and digital services. Similarly, the CER upgrade with Australia, concluded in 2023, strengthened digital trade cooperation and added provisions for emerging technologies, reflecting both countries' commitment to modernizing their trade relationship in the digital age (New Zealand Foreign Affairs & Trade, 2024).

#### **4.2 The impact of digitalization on NZ's participation in GVC led trade**

To analyze the impact of digitalization on NZ's GVC participation in GVC led trade, this study chose to examine three sets of correlations using data during 2011 and 2020, namely digital adoption and total trade, digital adoption and GVC participation, and digital adoption and GVC linkages. Among them, digital adoption was measured by two digital adoption indicators, namely NZ's Internet penetration rate and ICT use index. The relevant data was sourced from ITU and OECD Digital Economy Outlook respectively. Total trade was measured by the sum of NZ's exports and imports as percentage of NZ's GDP, which was sourced from World Bank WITS and Stats NZ. GVC linkages were measured by NZ's GVC forward and backward linkages, and sourced from OECD TiVA.

#### 4.2.1 Correlation between digital adoption and total trade

Before examining the correlation between NZ's digital adoption indicators and total trade, this study used scatter plots to intuitively present the relationships between them.

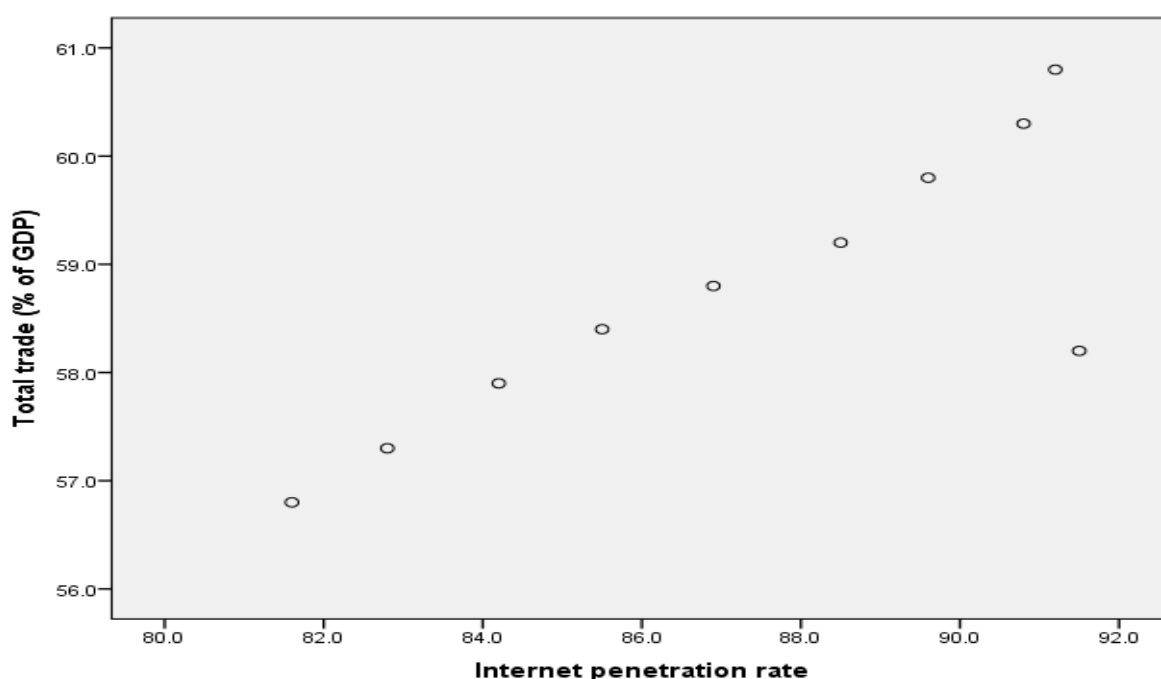


Figure 4.7: Relationship between NZ's Internet penetration rate and total trade of GDP

Figures 4.7 and 4.8 show the important relationship between the adoption of digital technology and NZ's trade performance. Figure 4.7 demonstrates a strong positive correlation between Internet penetration rate and total trade as percentage of GDP. Despite the COVID-19 outlier in 2020, data points still showed a significant upward trend. Likewise, Figure 4.8 shows the close relationship between the ICT use index and the percentage of trade. Both correlations indicate that as NZ's digital connectivity and technology utilization rate increase, its international trade activities could also expand accordingly. This highlights the key role of digitalization in improving NZ's global trade integration and economic performance.

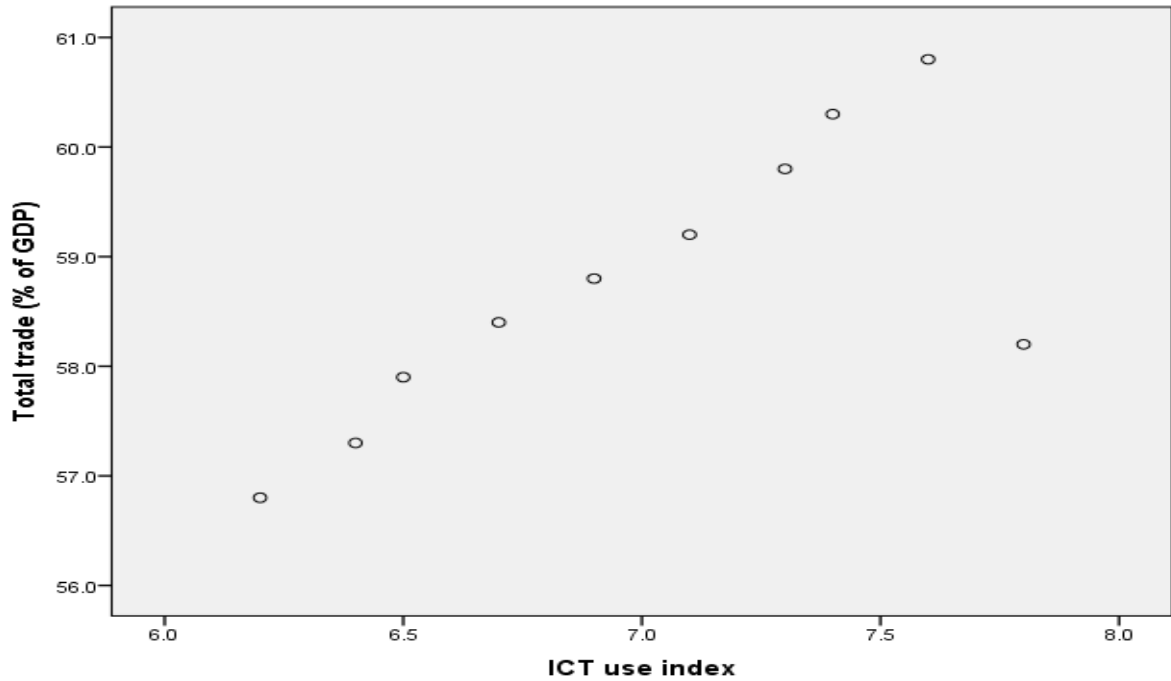


Figure 4.8: Relationship between NZ's ICT use index and total trade of GDP

Table 4.2: Correlation between NZ's digital adoption indicators and total trade of GDP

		Internet penetration rate	ICT use index	Total trade of GDP
Internet penetration rate	Pearson Correlation Sig. (2-tailed) N	1 10	.988** .000 10	.833** .003 10
ICT use index	Pearson Correlation Sig. (2-tailed) N	.988** .000 10	1 10	.756* .011 10
Total trade of GDP	Pearson Correlation Sig. (2-tailed) N	.833** .003 10	.756* .011 10	1 10

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

This study made correlation analysis to determine the correlation between digital adoption indicators and total trade of GDP. Specifically, the Pearson correlation coefficient was used to measure the linear correlation between variables (Creswell & Creswell, 2022). As can be

seen from Table 4.2, there was a statistically significant positive correlation between NZ's Internet penetration rate and total trade of GDP ( $r = 0.833$ ,  $p = 0.003$ ). Meanwhile, NZ's ICT use index showed a slightly lower but still significant positive correlation ( $r=0.756$ ,  $p=0.011$ ) with its total trade of GDP. The findings indicate that NZ's increased digital connectivity and technology utilization can greatly improve its international trade performance, which implies that digitalization is the key driving force for the integration of NZ's trade into the global economy. The findings were also in line with Li et al.'s (2024) research findings, that is, there was a similar positive correlation between the adoption of digital technologies and trade performance in many countries.

#### 4.2.2 Correlation between digital adoption and GVC participation

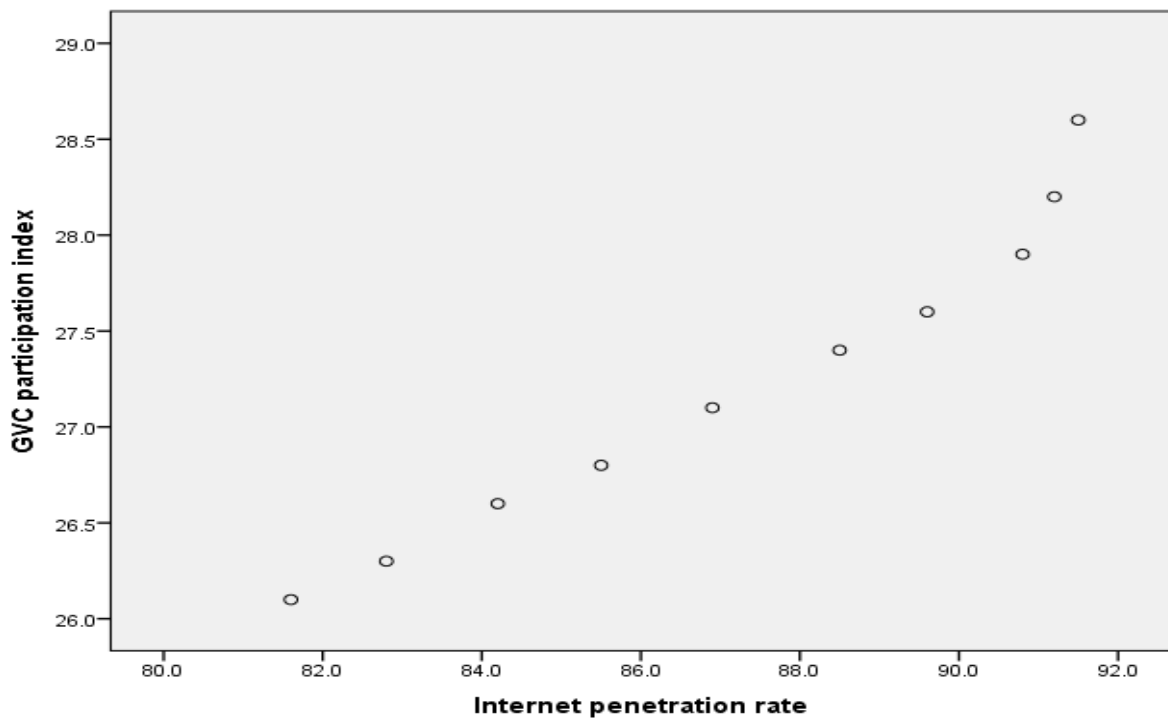


Figure 4.9: Relationship between NZ's Internet penetration rate and GVC participation index

As can be seen from Figure 4.9 and Figure 4.10, both NZ's Internet penetration rate and ICT use index were positively related to NZ's GVC participation index. There was no outlier in two scatter plots.

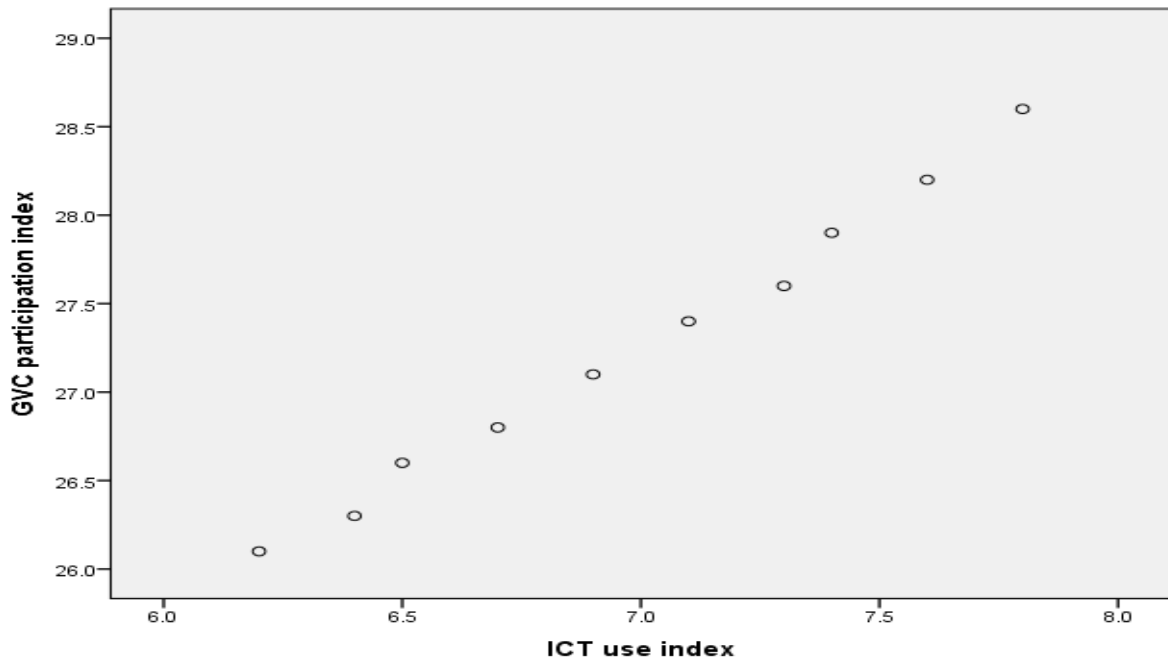


Figure 4.10: Relationship between NZ's ICT use index and GVC participation index

Table 4.3: Correlation between NZ's digital adoption indicators and GVC participation index

		Internet penetration rate	ICT use index	GVC participation index
Internet penetration rate	Pearson Correlation Sig. (2-tailed) N	1  10	.988** .000 10	.979** .000 10
ICT use index	Pearson Correlation Sig. (2-tailed) N	.988** .000 10	1  10	.996** .000 10
GVC participation index	Pearson Correlation Sig. (2-tailed) N	.979** .000 10	.996** .000 10	1  10

\*\* . Correlation is significant at the 0.01 level (2-tailed).

This study conducted correlation analysis to determine the correlation between digital adoption indicators and GVC participation index. As indicated in Table 4.3, there was a statistically significant positive correlation between NZ's Internet penetration rate and GVC participation index ( $r = 0.979$ ,  $p < 0.001$ ). Meanwhile, there was a stronger and statistically

significant positive correlation between NZ's ICT use index and GVC participation index ( $r = 0.996$ ,  $p < 0.011$ ). The findings show that NZ's adoption of digital technology is closely related to its ability to participate in GVCs. The strength of these correlations exceed those for overall trade, which indicates that digitalization is even more important than traditional trade relations for the integration of GVCs. The results were consistent with the research findings of Gopalan et al. (2022). They considered that there is a similar positive correlation between the adoption of digital technologies by emerging markets and their participation in GVCs, but the degree of impact varied owing to NZ's status as a developed economy.

#### 4.2.3 Correlation between digital adoption and GVC linkages

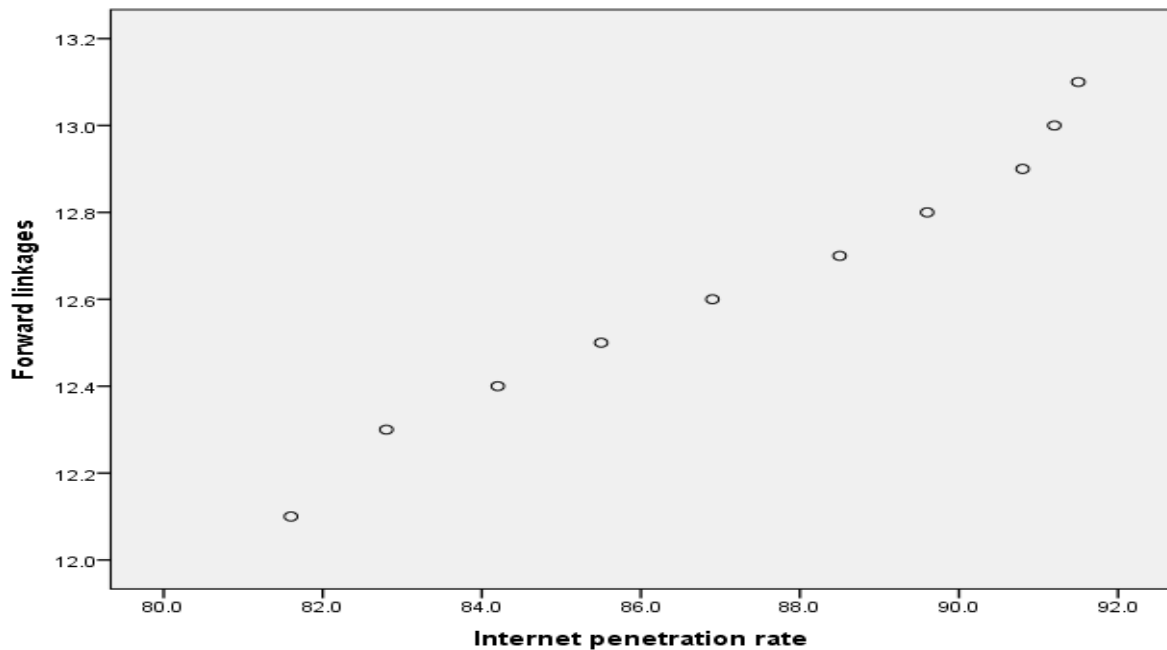


Figure 4.11: Relationship between NZ's Internet penetration rate and forward linkages

From Figure 4.11 and Figure 4.12, it can be known that NZ's Internet penetration rate was positively related to NZ's GVC forward and backward linkages. There was no outlier in two scatter plots.

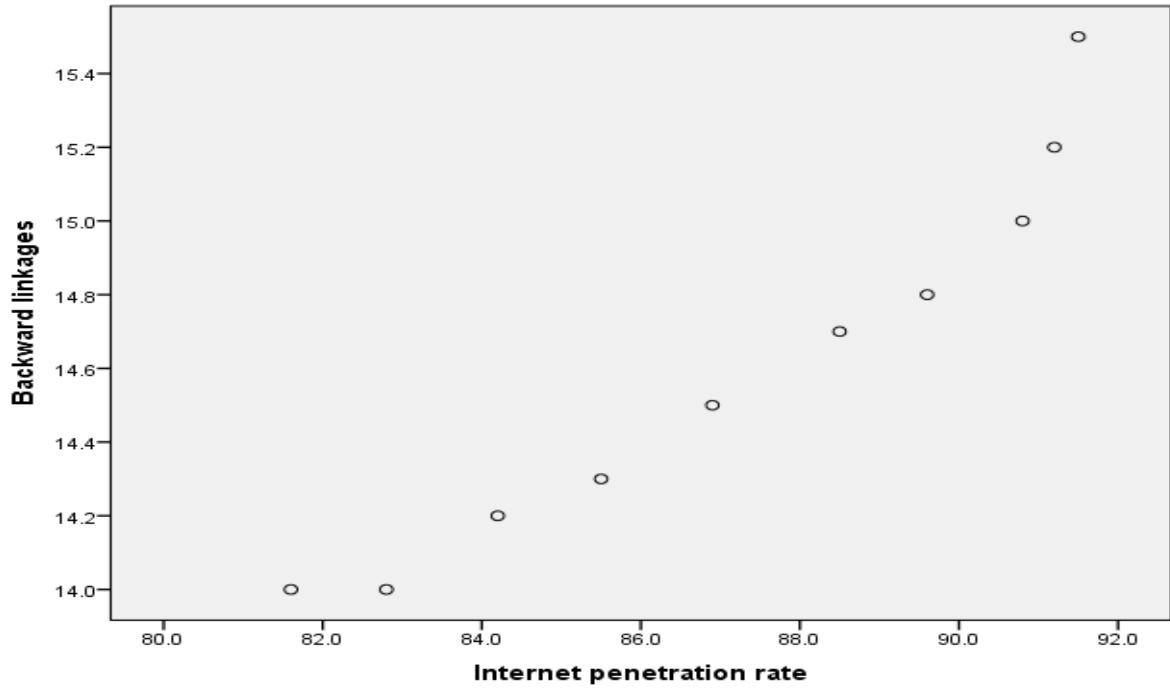


Figure 4.12: Relationship between NZ's Internet penetration rate and backward linkages

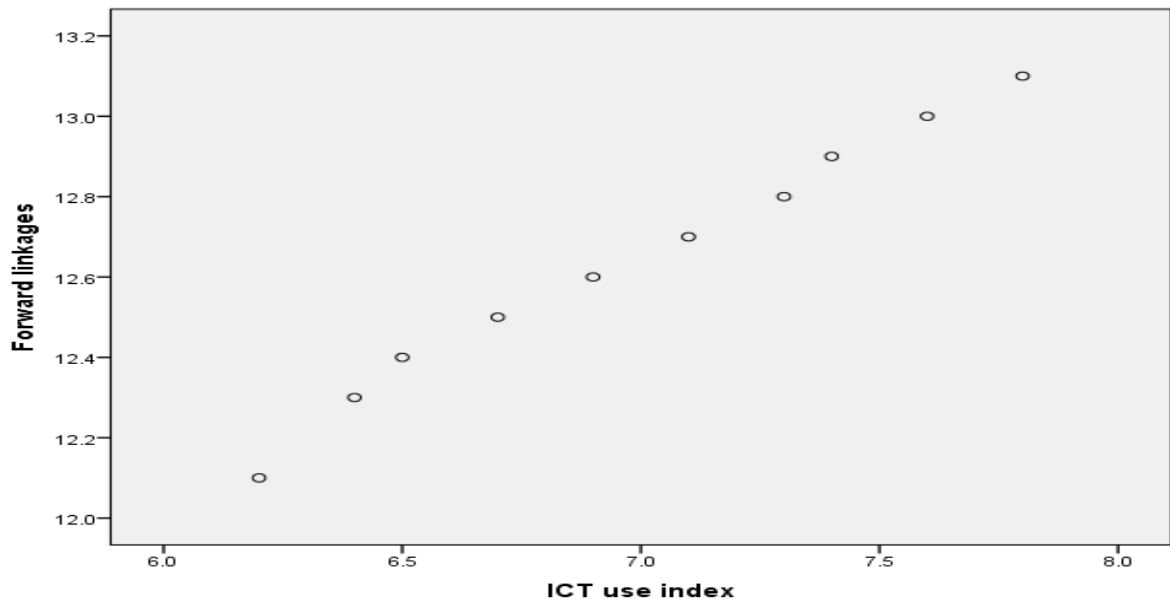


Figure 4.13: Relationship between NZ's ICT use index and forward linkages

As displayed in Figure 4.13 and Figure 4.14, NZ's ICT use index was positively related to NZ's GVC forward and backward linkages. There was no outlier in two scatter plots.

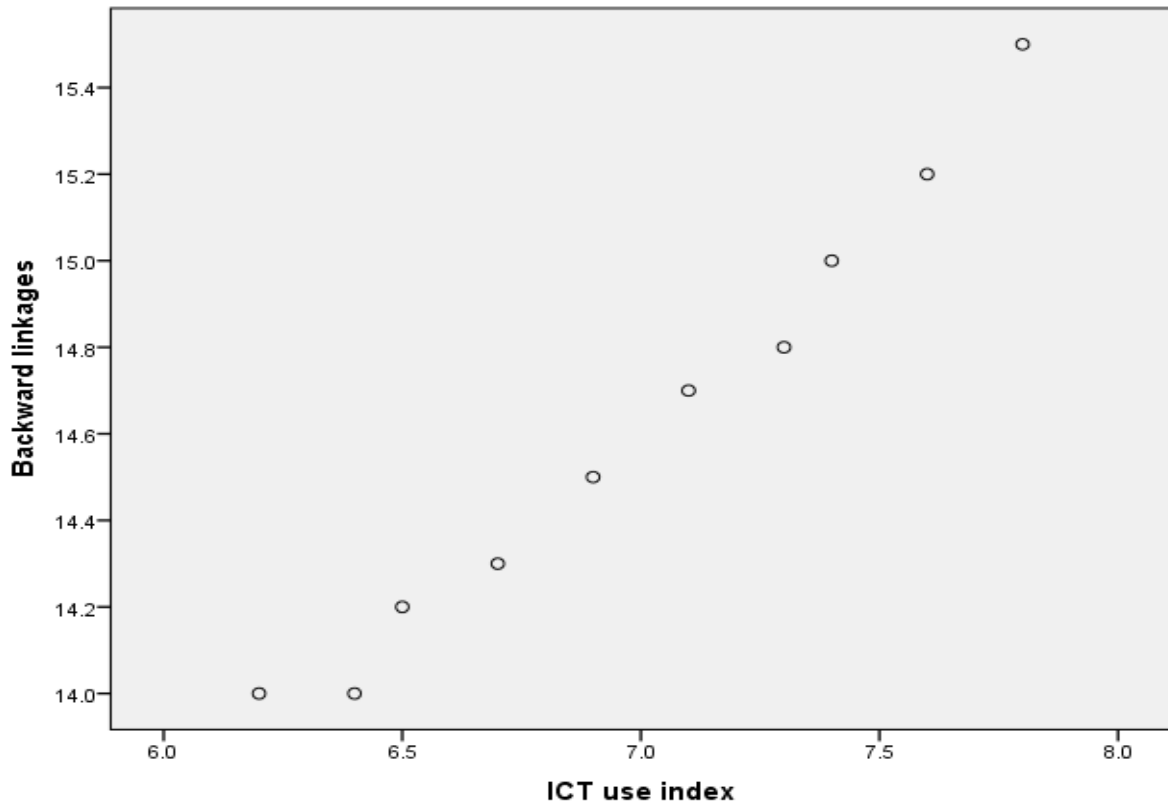


Figure 4.14: Relationship between NZ's ICT use index and backward linkages

Moreover, this study also conducted correlation analysis to determine the correlation between digital adoption indicators and GVC linkages. From Table 4.4, it can be known that two digital adoption indicators (i.e., Internet penetration rate and ICT use index) were significantly positively correlated with two GVC links (i.e., forward and backward linkages), their Pearson correlation coefficient was more than 0.96. In comparison, two digital adoption indicators had stronger correlations with forward linkages than backward linkages. This indicates that digitalization has a larger impact on NZ's ability to increase the DAV of export products used to produce other countries. This was in line with NZ's position as an important supplier of intermediate inputs, especially in its agricultural and food processing value chains. In addition, compared with the Internet penetration rate, the ICT use index showed a stronger correlation with both forward linkages ( $r = 0.994$ ) and backward linkages ( $r = 0.989$ ). This implied that comprehensive digital technology adoption is more significant for NZ's GVC

participation. Digitalization has enhanced NZ's ability to provide intermediate inputs to the global production networks, rather than including foreign inputs in its exports.

Table 4.4: Correlation between NZ's digital adoption indicators and GVC linkages

		Internet penetration rate	ICT use index	Forward linkages	Backward linkages
Internet penetration rate	Pearson Correlation Sig. (2-tailed) N	1	.988** .000 10	.989** .000 10	.964** .000 10
ICT use index	Pearson Correlation Sig. (2-tailed) N	.988** .000 10	1	.994** .000 10	.989** .000 10
Forward linkages	Pearson Correlation Sig. (2-tailed) N	.989** .000 10	.994** .000 10	1	.977** .000 10
Backward linkages	Pearson Correlation Sig. (2-tailed) N	.964** .000 10	.989** .000 10	.977** .000 10	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

In short, this study identifies a strong positive correlation between digitalization and NZ's participation in GVCs, especially in services and high-tech industries, though causal relationships cannot be established from this analysis alone. As NZ continues to invest in digital infrastructure and skills, its GVC participation is likely to evolve further, potentially closing the gap with the OECD average.

### 4.3 The role of trade agreements incorporated the elements of digitalization in facilitating GVC trade for NZ

Analysis of NZ's recent trade agreements, particularly those with digital trade provisions, reveals their potential impact on its GVC participation. The CPTPP includes a dedicated e-commerce chapter that addresses issues such as data localization and cross-border data

flows (New Zealand Foreign Affairs & Trade, 2018). Examining trade data post-CPTPP implementation shows significant growth in digital trade with CPTPP partners. According to Stats NZ (2021), NZ's exports of digitally delivered services to CPTPP countries increased by 13.5% between 2018 and 2020, outpacing overall services export growth. This growth was particularly pronounced in computer and information services, which saw a 22% increase during the same period.

Analysis using APTIAD reveals that NZ has been particularly active in incorporating digital trade provisions within the Asia-Pacific context. NZ ranks among Asia-Pacific economies in the top quarter of the comprehensiveness of digital trade provisions in its regional agreements (APTIAD, 2024). According to the database, 73% of the trade agreements currently signed between NZ and its partners in the Asia-Pacific region contain specific digital trade provisions, while the average proportion of digital trade provisions in the region is 58%. The high coverage of digital trade can promote NZ's integration into regional digital value chains. During 2020 and 2023, cross-border data flows between NZ and its Asia-Pacific partners increased by 25% (UNESCAP, 2024).

Signed in 2020 and being effective in 2021, DEPA is a more targeted digital trade facilitation approach. Although it is too early to comprehensively quantify its impacts, preliminary data showed good prospects. According to the New Zealand Foreign Affairs and Trade (2023), the cross-border data flows between New Zealand and other DEPA signatories (i.e., Singapore and Chile) increased by 17% in the first year after the implementation of the DEPA. This indicates strengthened digital connectivity and greater potential for GVC integration.

Based on OECD (2023), NZ's GVC participation patterns have undergone major changes while implementing digital trade provisions. The share of FAV in NZ's exports of ICT services increased significantly to 19.8% in 2020 from 16.2% in 2018, but the DAV in the exports of digital-intensive industries increased by 22% during the same period. The growth was

accompanied by an increase in service content in manufacturing exports, from 33.5% in 2018 to 37.2% in 2020. This demonstrates the further integration of digital services into the manufacturing value chains. After the implementation of DEPA, cross-border data-intensive service trade grew especially strongly, with an annual growth rate of 12.3% (OECD, 2023). This shows that targeted digital trade provisions can positively affect the participation of GVCs.

The New Zealand-UK Free Trade Agreement recently signed in 2022 contains comprehensive digital trade provisions. It is expected that the agreement will greatly promote digital trade between these two countries. The forecast of the New Zealand Institute of Economic Research (2021) shows that by 2025, the digital trade chapter would increase digital service exports to the UK by 30%.

An analysis of the content of these agreements indicates that a more comprehensive and binding commitment to digital trade is the general trend. This is consistent with Burri and Polanco's (2020) research results. That is, there was a more complex global trend in digital trade provisions in recent trade agreements. These provisions are conducive to addressing NZ's challenge of geographical isolation and strengthening its participation in knowledge-intensive GVCs. These agreements in promoting GVC-led trade have become increasingly effective. According to a report by the New Zealand Productivity Commission (2024a), compared with non-participating enterprises, enterprises involved in digital trade under these new agreements are more likely to participate in GVCs by 15%. Meanwhile, the DVA content of the products exported by these enterprises has increased by 7%. This indicates that they are moving up the value chain.

Whereas these agreements' benefits are not evenly distributed in all industries and enterprise sizes. According to the data from the New Zealand Institute of Economic Research (2021), 72% of large enterprises said they took advantage of the digital trade provisions in FTAs, but

only 28% of SMEs did so. This shows the need to formulate targeted policies to enable SMEs to make full use of the opportunities brought by these agreements. The COVID-19 pandemic emphasized the significance of digital trade provisions in promoting participation in GVCs. ExportNZ's (2022) survey indicated that 63% of NZ's exporters increased the utilization of digital platforms for international trade during the COVID-19 pandemic, of which 41% of exporters believed that the digital trade provisions in FTAs are the key to this transformation.

All in all, the overall impacts of recent trade agreements containing digital provisions have gradually emerged, but early indicators show that these agreements have positively affected NZ's participation in GVCs. To achieve these agreements' potential, the NZ government needs to make continuous efforts to improve the digital readiness of all economic sectors, especially laying more emphasis on SMEs.

#### **4.4 Discussion**

The above results had some views on the relationships between NZ's digitalization, trade agreements and participation in GVC-led trade. Combined with the literature reviewed in Chapter 2, these results provide detailed comprehension of NZ's position in the evolving GVCs.

NZ's evolution of GVC participation indicated the complex patterns of its participation in global production networks. The analysis of FVA content implied that NZ's FVA content fell from 16.5% in 2008 to 12.8% in 2020, much lower than the OECD average of 26.7%. This demonstrated NZ's geographical isolation and unique economic structure (OECD, 2023). Likewise, NZ's DAV in foreign final demand fell from 28% in 2000 to 19.7% in 2020. This suggested that its forward participation patterns have been changing. This trend is consistent with Gereffi and Fernandez-Stark's (2011) observations. They emphasized the impacts of geographical and structural factors on a country's integration into global production networks. The sectoral analysis reveals particularly strong forward participation in agriculture (56.3%)

and food products (55.6%), while manufacturing sectors show higher backward integration, especially in transport equipment and electronics (OECD, 2023). This pattern supports the argument of López González and Ferencz (2018) that small economies can develop specialized roles within GVCs based on their comparative advantages. For NZ, this is particularly evident in the primary sectors, where forward integration ratios exceed 0.6, indicating successful positioning as a supplier of inputs to global value chains. The evolution of trade partner relationships, with China's share reaching 25% of both gross and value-added exports by 2020, further demonstrates NZ's adaptation to changing global economic geography and its strategic approach to GVC participation.

The positive correlation between digital adoption and GVC participation observed in NZ aligns with the theoretical predictions of Baldwin (2019) regarding the role of digital technologies in reducing coordination costs and facilitating the unbundling of production processes. The increase in cloud computing adoption from 47% in 2018 to 58% in 2020 among NZ businesses, coupled with the 18% growth in domestic value-added in foreign exports for the ICT services sector, exemplifies this relationship (OECD, 2023; Stats NZ, 2021). There was a strong positive correlation between digital adoption indicators and trade/GVC indicators, which was consistent with the views of Strange and Zucchella (2017). They argued that Industry 4.0 technologies are enabling more decentralized and flexible production networks, potentially reducing power asymmetries in traditional GVC structures. The analysis of the correlation between digital adoption indicators and total trade supported the findings of Li et al. (2024), that is, digital technologies could enhance the GVC status of countries. It is noteworthy that NZ's ICT use index was strongly correlated with GVC participation, which was supported by Baldwin's (2019) theoretical prediction on digital technology to reduce coordination costs and promote production unbundling. In addition, the analysis of the impacts of digital adoption indicators on GVC linkages confirmed and challenged the existing literature. The strong correlations between digital adoption indicators and forward and backward linkages were extremely high, which were significantly stronger than previous

empirical studies. For example, Gopalan et al. (2022) pointed out that their correlations were between 0.5 and 0.7 in emerging markets. The great difference may be caused by NZ's advanced digital infrastructure and institutions. Li et al. (2024) believed that these factors were important moderating variables of the impact of digitalization on GVC participation. Furthermore, this study found that compared with backward linkages, digital adoption indicators had stronger correlations with forward linkages. The finding was in sharp contrast to several existing literature. Park et al. (2023) argued that in developed economies, the adoption of digital technologies usually had a greater impact on backward linkages than forward linkages. The difference may demonstrate NZ's unique economic structure and comparative advantages in the agricultural and food processing industries, which supported van der Marel's (2015) view on the significance of specialization in niche areas for small economies.

In addition, the role of trade agreements in facilitating GVC trade through digital provisions is becoming increasingly evident in NZ's case. The 13.5% growth in exports of digitally delivered services to CPTPP countries between 2018 and 2020 and the 17% increase in cross-border data flows with DEPA signatories in the first year of implementation demonstrate the potential of these agreements (New Zealand Foreign Affairs & Trade, 2023; Stats NZ, 2021). These findings support the arguments of Mattoo et al. (2020) that deep trade agreements can enhance GVC participation. Whereas the effectiveness of these agreements relies on the matching of domestic policies and the readiness of enterprises. This was proved by the utilization gap between large enterprises (72%) and SMEs (28%) that the New Zealand Institute of Economic Research (2021) reported.

Furthermore, the results of this study also uncovered the opportunities and challenges for NZ to participate in GVCs. There is a gap between NZ's GVC participation and the OECD average. This shows that in addition to digitalization and trade agreements, market size, geographical isolation and some other factors can also affect the extent of NZ's integration

into GVCs. This is in line with Shepherd's (2021) concerns that in the post-COVID era, the regionalization of the value chains may increase. This may pose a challenge to NZ. In addition, the balanced growth of forward and backward linkages also makes people doubt whether NZ has obtained great value in GVCs, or whether it has the potential to upgrade to activities with higher added value. The concerns coincide with Gereffi et al.'s (2005) view that governance structure plays an important role in deciding the value acquisition in GVCs.

In a word, digitalization and trade agreements have had positive impacts on NZ's participation in GVC-led trade, but their potential still needs to be fully developed. The research results show that it is necessary to formulate targeted policies to improve SME's ability to participate in digital GVCs and make full use of the opportunities that recent trade agreements have brought about. In addition, the service industries' strong performance in participating in GVCs shows that NZ can gain benefits from the further specialization of high-value and knowledge-intensive services.

## **Chapter 5: Conclusions and Recommendations**

This chapter aims to make a summary of key results, recognize the limitations of the study, and make recommendations for both future research and NZ Government to better participate in GVC led trade in the digital age.

### **5.1 Key results**

This study comprehensively analyzed the impact of digitalization and trade agreements on NZ's participation in GVCs and obtained some key results.

Firstly, this study revealed a decline in NZ's integration into global production networks, with its GVC participation (including backward and forward GVC participation) showing a decreased trend between 2008 and 2020. Its GVC participation was lower than the OECD average, which indicated the potential for NZ to further improve its GVC participation. From the industry perspective, NZ has significant backward participation in GVCs in coke and refined petroleum, motor vehicles, and other transport equipment, while has higher forward participation into GVCs in agriculture, food products (including beverages), and basic metals. The mining and agriculture had strong forward integration ratios, while manufacturing sectors had more balanced integration patterns. Moreover, China, Australia, the United States, and the European Union (including 27 countries) are major trade partners of NZ.

Secondly, this study found a clear positive correlation between NZ's digital adoption and its GVC participation. Along with the increase in NZ's Internet penetration rate and ICT use index, there was a corresponding rise in its total trade of GDP, GVC participation index, as well as forward and backward linkages. Compared to backward linkages, digital adoption indicators had stronger correlations with forward linkages. The findings underscored the importance of digital technologies in enhancing NZ's competitiveness in global markets.

Thirdly, recent trade agreements with digital provisions have shown promising early results for NZ's GVC participation. Exports of digitally delivered services to CPTPP countries increased by 13.5% between 2018 and 2020, while DEPA led to a 17% increase in cross-border data flows with signatories in its first year of implementation. These outcomes highlight the potential of such agreements to facilitate NZ's integration into digital value chains. However, the benefits of digitalization and trade agreements are not uniformly distributed across all sectors and firm sizes. While 72% of large enterprises reported leveraging digital trade provisions in FTAs, only 28% of SMEs did so, indicating a significant gap in utilization. This disparity points to the need for targeted policies to support SMEs in capitalizing on the opportunities presented by digital trade and modern trade agreements.

Despite these challenges, NZ's GVC participation has shown resilience, particularly in the agri-food sector. The country's ability to maintain strong positions in traditional sectors while expanding its presence in services GVCs demonstrates a nuanced approach to global integration. However, the persistent gap between NZ's GVC participation and the OECD average suggests untapped potential for further integration.

## **5.2 Limitations of the study**

This study has a few limitations that should be acknowledged. For example, the reliance on secondary data, with the most recent comprehensive GVC participation data available only up to 2020, may not fully capture the most recent trends, especially considering the rapid pace of digital transformation and the impacts of global events like the COVID-19 pandemic. The focus on specific trade agreements, while significant, may not represent the full spectrum of NZ's trade relationships. In addition, although correlations between digitalization, trade agreements, and GVC participation were identified, establishing clear causal relationships was beyond the scope of this study. Furthermore, a structural gravity model in a panel data set up is most appropriate for this study, but data requirements cannot be completed in the given time period of the dissertation.

## **5.3 Recommendations**

### **5.3.1 Recommendations for future research**

Given the limitations of this study, future research should focus on conducting longitudinal studies to assess the long-term impacts of digital trade provisions in agreements like CPTPP and DEPA on NZ's GVC participation. Sector-specific analyses, particularly in key industries such as dairy, wine, and professional services, would provide more nuanced insights into how digitalization and trade agreements affect GVC participation in different contexts. Additionally, investigating the specific challenges and opportunities for SMEs in leveraging digital technologies and trade agreement provisions for GVC participation is crucial. Moreover, future research may construct a structural gravity model based on the panel data to comprehensively examine the impacts of digitalization and trade agreements on GVC participation.

### **5.3.2 Recommendations for NZ Government**

For the NZ government, a multi-faceted approach is recommended. Developing targeted programs to support SMEs in adopting digital technologies and leveraging trade agreement provisions is essential. By carrying out continued investment in digital infrastructure, the NZ government can guarantee that NZ maintains strong competitiveness in the digital aspects of GVVCs. It should give priority to strengthening education and training programs to develop digital skills needed to participate effectively in GVCs, laying more emphasis on digital literacy and technical skills.

Drawing on the lessons learned from DEPA and some other trade agreements, NZ should also give priority to provisions that promote its digital trade and the participation of GVCs in trade negotiations. While acknowledging the opportunities and challenges faced by enterprises in different industries, it will be crucial for the NZ government to develop industry-specific strategies to promote its participation of GVCs. It is recommended to

cultivate a strong innovative ecosystem to motivate the development and adoption of digital technologies that are associated with NZ's major export industries. This is conducive to improving its competitiveness in the long run.

Through the implementation of the above recommendations, NZ is likely to improve its position in GVCs and take advantage of its advantages in digital technology applications and trade agreements, to deal with NZ's small market size and geographical isolation. In the changing global trade landscape, this will help NZ achieve long-term economic development, improve its competitiveness, and play a more important role in global economy.

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## Appendix

**Table A1: Key data on digital adoption, trade, and GVC participation for NZ, 2011-2023<sup>4</sup>**

Year	Internet penetration rate	ICT use index	Total trade of GDP (%)	GVC participation index	Forward linkages	Backward linkages
2011	81.6	6.2	56.8	26.1	12.1	14.0
2012	82.8	6.4	57.3	26.3	12.3	14.0
2013	84.2	6.5	57.9	26.6	12.4	14.2
2014	85.5	6.7	58.4	26.8	12.5	14.3
2015	86.9	6.9	58.8	27.1	12.6	14.5
2016	88.5	7.1	59.2	27.4	12.7	14.7
2017	89.6	7.3	59.8	27.6	12.8	14.8
2018	90.8	7.4	60.3	27.9	12.9	15.0
2019	91.2	7.6	60.8	28.2	13.0	15.2
2020	91.5	7.8	58.2	28.6	13.1	15.5
2021	92.1	7.9	61.5	28.9	13.2	15.7
2022	92.8	8.1	62.4	29.2	13.4	15.8
2023	93.4	8.3	63.2	29.5	13.5	16.0

<sup>4</sup> Data sources: ITU, OECD Digital Economy Outlook, World Bank WITS, Stats NZ, and OECD TiVA.