

Digital Transformation and Global Trade

Şahin Çetinkaya¹

Abstract

This study comprehensively examines the impact of digital transformation—and the blockchain, artificial intelligence, and big data analytics that drive it—on international trade. Global trade has developed and evolved in tandem with emerging technologies. Today, the trade model based on traditional physical borders has been replaced by the dematerialization of trade, the rise of trade in services, and the digital integration of Global Value Chains (GVCs). This study investigates the democratization opportunities created by e-commerce for SMEs, the phenomenon of micro-multinationalization, and the effects of technologies such as Artificial Intelligence, the Internet of Things (IoT), and blockchain on logistics efficiency and supply chains. Global digital transformation has created governance gaps within international regulatory frameworks. In particular, issues such as data localization policies, cybersecurity risks, and the taxation of digital services (OECD Pillar One/Two) have emerged as new areas of contention in global trade. By taking into account the global e-commerce volume reaching approximately \$6.8 trillion as of 2024 and the 6.5% share of e-commerce in Türkiye's GDP, this study analyzes the macroeconomic dimensions reached by digital transformation. In this context, the implementation of international standardization and inclusive development policies is imperative to minimize the risk of the digital divide and to establish a sustainable global trade structure.

1. Introduction

Global trade, shaped within the triangle of blockchain, artificial intelligence, and big data, is undergoing its most radical structural transformation since 17th-century mercantilism by surpassing traditional rules and physical limitations. Technological advancements, which have progressed rapidly since the late 20th century, are subjecting the global

¹ Assoc. Prof. Dr., Aksaray University, Faculty of Health Sciences, Department of Health Management, sahincetinkaya@aksaray.edu.tr, ORCID iD: <https://orcid.org/0000-0002-2937-4247>

economy and the nature of international trade to a fundamental change. Particularly in the last decade, the integration of breakthrough technologies such as artificial intelligence, the Internet of Things, big data analytics, cloud computing, and blockchain into commercial processes has heralded a new era termed “Digital Transformation” (WEF, 2023). Digital transformation is creating a new global trade ecosystem that not only optimizes the way companies do business but also blurs geographical borders.

Traditionally, international trade was structured around customs processes for physical goods, logistics costs, and long supply chains. However, today, even small and medium-sized enterprises (SMEs) can easily access global markets through digital platforms; many services ranging from financial services to software, and from education to healthcare, can be offered across borders instantly via digital channels (UNCTAD, 2022). This situation strengthens the trend of “dematerialization” of trade, rapidly changing both the volume and composition of trade.

1.2. Digital Transformation Outlook

While digital transformation creates opportunities in global trade (such as cost reduction, increased market access, and efficiency), it also gives rise to a series of new and complex challenges. Foremost among these issues is the inability of international regulatory frameworks to keep pace with the digital age. While customs tariffs and quota applications focus predominantly on physical goods, issues such as the taxation, privacy, and security of cross-border data flows have yet to be standardized at the international level (Ertürk, 2024).

Another significant problem is the digital divide. While countries possessing digital infrastructure, technological competence, and human capital (generally developed economies) derive great benefits from digital trade; developing countries and Least Developed Countries (LDCs) lacking these capabilities face the risk of being excluded from global trade flows. This situation carries the potential to deepen inequalities in global trade. Furthermore, issues such as cybersecurity threats, the monopolistic tendencies of platform economies, and consumer protection are challenges awaiting urgent solutions for trade governance in the digital age (Manyika et al., 2016).

1.3. Purpose and Scope of the Chapter

The main purpose of this book chapter is to examine the comprehensive effects of digital transformation on global trade within a theoretical and

applied framework. In this direction, the chapter will focus on three main areas:

1. The Impact of Digitalization on Trade Flows: Micro and macroeconomic effects, such as the rise of e-commerce, the shift in trade in services, and the transformation of global supply chains, will be analyzed.
2. Governance and Policy Issues: Cross-border data flows, digital taxation, new provisions in trade agreements, and regulatory compliance challenges will be evaluated.
3. Inclusiveness and Equity: The inequalities created by the digital divide in global trade will be examined, and proposals for inclusive digital trade policies will be presented.

Through this comprehensive analysis, the aim is to create a guiding resource for decision-makers determining trade policies at both national and international levels, as well as for academics and the business world.

2. Conceptual Definitions

2.1. Digital Trade

While digital trade is generally used synonymously with the concept of electronic commerce (e-commerce), it denotes a broader scope. The most common and accepted definition focuses on the execution of commercial transactions in electronic and digital environments. In other words, it encompasses all processes, technologies, and data that digitally enable trade activities. It includes elements such as digital marketing, cloud computing, supply chain integration, data analysis, and digital payment systems.

2.1.1. Digital Trade Models

Digital trade is divided into various models based on the actors involved in the trade:

- B2C (Business to Consumer): The model where businesses sell their products directly to individual consumers.
- B2B (Business to Business): The model where businesses sell raw materials, equipment, or services to other businesses (It is the largest e-commerce segment in terms of volume).
- C2C (Consumer to Consumer): The situation where individuals sell

to other individuals through online platforms (marketplaces).

- C2B (Consumer to Business): The model where consumers offer services or value-creating content to businesses (e.g., Freelancers providing services to companies via platforms).

2.2. Global Trade

It is the fundamental mechanism connecting the world economy, denoting the exchange of goods, services, and capital across national borders. Traditionally, it is explained through the concepts of *export* (what a country sells abroad) and *import* (what a country buys from abroad).

2.2.1. Theoretical Foundations of Global Trade

The reasons why global trade occurs are explained by fundamental economic theories:

Absolute Advantage Theory: This theory belongs to the Scottish economist Adam Smith. It appears in Smith's classic work, "The Wealth of Nations," published in 1776. It proposes that a country should focus on the product it can produce in greater quantity using fewer resources compared to other countries.

Comparative Advantage Theory: According to this theory put forward by David Ricardo in the 19th century, countries should focus on producing the products they are best at by trading with each other. David Ricardo argues that even if a country can produce everything cheaper than another, it should focus on the product with the lowest opportunity cost. This specialization ensures an increase in world production and general welfare.

2.2.2. Historical Development and Governance

International trade dates back to ancient trade networks such as the Silk Road, but modern global trade gained momentum particularly after the Industrial Revolution.

- Mercantilism: This doctrine, which was dominant in the 17th and 18th centuries, argued that a country should acquire its wealth by increasing exports and decreasing imports (Savas, 1997).
- GATT and WTO: After the Second World War, the General Agreement on Tariffs and Trade (GATT) (1947) was established with the aim of reducing customs tariffs and other trade barriers. In 1995, GATT transformed into the World Trade Organization (WTO), which sets global trade rules and resolves disputes. The establishment

of the WTO (as a result of the Uruguay Round) is considered one of the most significant steps in economic globalization (Saruhan, 2010).

2.2.3. Current Trends and Challenges

In recent years, international trade has entered a process of structural and dynamic change, driven by geopolitical tensions, the effects of global pandemics, and especially the momentum of digital transformation. Traditional trade patterns and business practices are being reshaped under the pressures of the new global economic order.

Table 1: Evolution of Global Trade and Current Dynamics		
Area	Traditional Structure	Current Trends and Challenges
Trade Structure	Inter-industry Trade (e.g., Agricultural products from country A, industrial products from country B)	Global Value Chains (GVCs) and Intra-industry Trade. Production is geographically distributed by being divided into sub-processes with different factor intensities (TCMB, 2010).
Trade in Services	Requiring physical travel or communication.	The Rise of Digital Trade: The volume of digitally deliverable services such as telecommunications, financial services, and e-commerce (including B2C sales) has increased rapidly (Burgan Foreign Trade, 2024; ISO, 2021).
Geopolitics	Trade is focused on economic benefit.	New Protectionism and Geopolitical Tensions: Protectionism (via non-tariff barriers) and trade wars (especially US-China tension) have increased. New concepts: <i>Nearshoring</i> (shifting supply chains to nearby geographies) and <i>Friendshoring</i> (focusing on friendly countries)

Source: İMMİB (2025).

This table summarizes the structural transformation that global trade has undergone from its traditional structure towards the new trends and challenges encountered today. When the structure of trade is examined, while Inter-industry Trade (e.g., one country exporting agricultural products and the other industrial products), where countries specialized in different industries, was dominant in the past; today, the Global Value Chains (GVCs) and Intra-industry Trade model, in which multinational corporations distribute

geographically by fragmenting their production processes according to different factor intensities, has become dominant (TCMB, 2010). While this model implies that different stages of a final product are produced in more than one country, it has ensured the deepening of global trade. At the same time, the field of Trade in Services, which formerly required physical travel or communication, has entered a period of The Rise of Digital Trade, where the volume of services that can be offered through digital platforms such as telecommunications, financial services, and B2C e-commerce has rapidly increased (Burgan Foreign Trade, 2024; ISO, 2021).

In addition to these structural changes, the fundamental motivation of trade has also shifted away from being focused on economic benefit to an area where geopolitical factors are strongly felt. Current trends point to the proliferation of New Protectionism policies, manifesting themselves through the increase of non-tariff barriers and trade wars (especially US-China tension). This situation has triggered the search to increase the reliability and resilience of global supply chains; in this context, new concepts have emerged such as Nearshoring (the strategy of shifting production and supply sources to geographies close to consumption markets) and efforts to focus supply chains on politically allied or friendly countries (Friendshoring) (IMMIB, 2025). These developments show that global trade is managed by a more complex dynamic that focuses not only on market efficiency but also on national security and political alignment.

3. Fundamentals and Components of Digital Transformation

3.1. Definition and Scope of Digital Transformation

Digital transformation (DX) is the process of making fundamental changes in business models, organizational culture, and operational processes by using technology as a tool. In the context of global trade, this transformation implies the shift of international transactions from physical to digital, and from linear processes to network-based ecosystems. There are a number of key technologies, often referred to as Industry 4.0 or the 4th Industrial Revolution, that form the basis of this transformation:

- Artificial Intelligence (AI) and Machine Learning: They play a critical role in demand forecasting, risk management, and the optimization of autonomous logistics systems in global supply chains. They automate and accelerate decision-making processes at every stage of trade.
- Big Data Analytics: It provides firms with a competitive advantage in global markets by analyzing cross-border consumer behaviors, market trends, and logistics data.

- Internet of Things (IoT): It increases transparency and security by enabling the real-time tracking of containers, warehouses, and products in international transport.
- Cloud Computing: It allows businesses to increase their operational capacities in the global market with low capital costs and facilitates cross-border collaboration.
- Blockchain Technology: It reduces the risk of fraud by increasing the security, transparency, and traceability of transactions, especially in supply chain finance and customs processes.

The integrated use of these technologies takes the level of speed, precision, and personalization in global trade to unprecedented levels.

3.2. Current Structure of Global Trade and Digitalization Trends

While traditional global trade relied primarily on the import and export of physical goods, trade in services and intellectual property flows have rapidly gained importance in recent years. Digital transformation is altering this structure in three main areas:

1. Dematerialization of Trade: Information and services become the subject of trade directly via digital channels (e-books, software, consultancy, digital media) without the need for a physical product. This increases the share of trade in services within global trade.
2. Evolution of Global Value Chains (GVCs): Digital platforms enable firms to manage suppliers and manufacturers in different countries more efficiently. Smart contracts and real-time tracking systems render GVCs more flexible and resilient.
3. Micro-Multinationalization (Micro-multinationals): E-commerce platforms (Amazon, Alibaba, Etsy, etc.) enable small businesses to reach international customers without bearing high marketing and distribution costs. This situation helps global trade evolve into a more democratic structure by moving away from the monopoly of large multinational corporations (OECD, 2021).

3.3. Economic Impacts of Digitalization

The contributions of digitalization to the global economy and trade can be measured at both macro and micro levels:

- Productivity Gains and Cost Reductions: Automation and artificial intelligence significantly reduce customs, paperwork, and logistics costs in cross-border transactions, thereby shortening transaction

times. This provides great efficiency, particularly in bureaucratic processes such as customs clearance.

- New Business Models and Market Creation: The “Platform Economy” has created new marketplaces and business models on a global scale. These platforms have opened new trade channels by bringing supply and demand together independently of geographical borders.
- Better Resource Allocation: Big Data analytics allows companies to improve their demand forecasts, thereby reducing inventory holding costs and ensuring more effective use of resources.

In summary, the fundamental components of digital transformation are reshaping global trade both structurally and functionally, which lays the groundwork for the effects on concrete trade flows to be discussed in the next section.

4. The Impact of Digitalization on Global Trade Flows

Digital transformation transforms the traditional channels and methods of global trade, leading to significant changes in the geographical and sectoral distribution of trade. These effects become evident particularly in the rise of e-commerce, the increase in trade in services, and the restructuring of supply chains.

4.1. The Rise of E-Commerce and Cross-Border Trade

The proliferation of digital platforms has exponentially increased the volume of cross-border retail e-commerce. Market entry costs, which are high in traditional trade (physical stores, distributor networks, international marketing), have been significantly reduced thanks to digital platforms.

- Access of Micro and Small Enterprises to Global Markets: E-commerce giants (e.g., Amazon, Alibaba, eBay) and other marketplaces allow SMEs and individual entrepreneurs (in C2C and B2C models) to offer their products directly to foreign consumers (WTO, 2018). This situation is termed the “democratization of trade” and ensures that participation in global supply chains is no longer limited to only large firms.
- Transformation of Consumer Behaviors: Consumers can easily access products anywhere in the world, and this increases the global demand for personalized products and services. Cross-border e-commerce expands the opportunity for consumers to shop without compromising on price, variety, and quality (Bughin et al., 2018).

- Regulatory and Logistical Facilitations: Digitized customs processes (electronic declarations, risk analysis) and logistics integrations (end-to-end tracking systems) both accelerate and reduce the cost of cross-border shipments made in small parcels.

4.2. Digitalization in Trade in Services

Digital technologies have become the driving force of trade in services, which grows faster than trade in physical goods. Many services that formerly required physical presence can now be delivered entirely digitally.

- Digitally Delivered Services:
 - Cross-Border Delivery: Services such as cloud computing services, software downloads, remote education, tele-health, and financial technologies (FinTech) can be offered instantly over the internet. This has created a new and massive market, particularly for professional and technical services.
 - Temporary Physical Presence: Remote collaboration of experts and travel supported by digital tools facilitate trade in services.
 - The Role of Data Flows in Trade: A significant portion of trade in services, especially in the e-commerce, finance, and technology sectors, relies on cross-border data flows. The international circulation of customer information, operational data, and intellectual property (software codes, algorithms) constitutes the foundation of modern trade. This situation has turned data governance and data localization policies into a main agenda item of global trade.

4.3. Transformation in Global Supply Chains

Digital technologies significantly affect the design, management, and resilience of Global Value Chains.

- Blockchain and Transparency: By offering the ability to record every transaction in the supply chain (production, transport, customs clearance) on an immutable ledger, blockchain allows the origin and journey history of the product to be tracked with a high level of transparency. This helps prevent counterfeiting and increases consumer confidence in issues such as food safety.
- Automation and Smart Logistics: Internet of Things (IoT) sensors, robotic systems, and AI-supported analytics reduce logistics costs and error rates by automating warehousing, packaging, and transport

processes (Arslan, 2023). Smart ports and autonomous vehicles increase cross-border logistics efficiency.

- Localization Trends (Re-shoring/Near-shoring): The development of 3D printing (additive manufacturing) technology makes the final assembly or production of certain products economically feasible closer to the consumer. While this may support the trend of shortening supply chains by reducing dependency on long and complex GVCs, it may also alter the structure of trade in physical goods.

These transformations signify fundamental changes not only regarding how large global trade is, but also regarding between whom, at what speed, and with which products it is conducted. These new dynamics create significant pressure on international trade policies and governance mechanisms, which will be discussed in the next section.

4. Digital Trade Policies and Governance Issues

The speed and flexibility created by digitalization in trade flows have revealed significant challenges for existing international trade law and regulatory frameworks. While traditional trade rules are established upon physical goods, the data flows, cybersecurity, and cross-platform competition at the center of digital trade have necessitated a new need for governance.

4.1. International Trade Agreements and Digital Trade Provisions

The World Trade Organization (WTO) and regional free trade agreements (FTAs) are in an effort to evolve to encompass digital trade, but this process is progressing slowly.

- E-Commerce Negotiations at the WTO: Although WTO members are trying to reach a consensus on a permanent Customs Duties Moratorium (non-application of customs duties on electronic transmissions), deep divisions persist on issues such as data localization, protection of intellectual property, and consumer rights (Aydin, 2024). The future of this moratorium remains uncertain due to developing countries' concerns regarding the loss of customs revenue.
- Regional and Bilateral Agreements: New generation FTAs such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and the United States-Mexico-Canada Agreement (USMCA) contain specific provisions regarding e-commerce and cross-border data flows. These agreements generally

encourage the free flow of data while restricting data localization requirements.

- Digitalization of Customs Processes: International cooperation attempts to remove non-tariff barriers in physical trade through the simplification and digitalization of customs processes (e.g., single window systems, electronic bills of lading).

4.2. Data Localization and Cross-Border Data Flows

Data flows, which are the most critical component of digital trade, constitute the most controversial area due to concerns regarding national security, privacy, and economic sovereignty.

- Data Sovereignty and Localization Policies: Some countries such as China, Russia, and India implement data localization laws mandating that the personal data of their citizens be stored and processed within the country's borders. These policies increase operational costs for international service providers and multinational corporations and hinder global trade by restricting the free flow of data (Karaarslan, 2023).
- Privacy and Data Protection Regulations: The European Union's General Data Protection Regulation (GDPR) has set a global standard. By binding the processing of EU citizens' data to strict rules, the GDPR requires all firms worldwide trading with this data to ensure compliance. This situation can cause data protection standards to constitute a regulatory barrier in global trade.
- **Cybersecurity Standards:** The protection of critical infrastructure and commercial data is a primary source of concern for states. Divergent national cybersecurity standards complicate cross-border digital trade by creating incompatibility and additional costs.

4.3. Taxation and Regulatory Challenges

The structure of the digital economy, which does not rely on traditional physical presence, significantly challenges international tax systems and competition authorities.

- Digital Services Taxes and Global Tax Reform: Traditional tax rules are based on taxing companies where they are physically located. However, digital platforms may not show physical presence in markets where they generate huge revenues. To close this gap, many countries like France and Türkiye have started implementing Digital Services

Taxes (DST) (Güler, 2022). This situation has led to trade tensions at the global level. The effort to introduce a global minimum corporate tax via the “Two-Pillar Solution” (Pillar One and Pillar Two), led by the OECD, aims to reshape the taxation of digital trade.

- Competition and Monopolization in the Platform Economy: The market power and monopolistic tendencies of global digital platforms (e.g., search engines, social media, e-commerce marketplaces) can exclude small competitors and SMEs from the global market. This situation requires international competition law cooperation to protect trade fairness and competition.
- Consumer Protection: In cross-border e-commerce, uncertainty remains regarding which country’s laws will protect consumers in issues such as counterfeit products, data breaches, and contractual disputes.

These regulatory and political challenges are the biggest obstacles standing in the way of fully realizing the potential of digital transformation. Solutions require the creation of new global trade governance mechanisms based on principles of international cooperation, transparency, and inclusiveness.

5. Digital Trade Outlook in the World and Türkiye

5.1. Digital Trade in the World

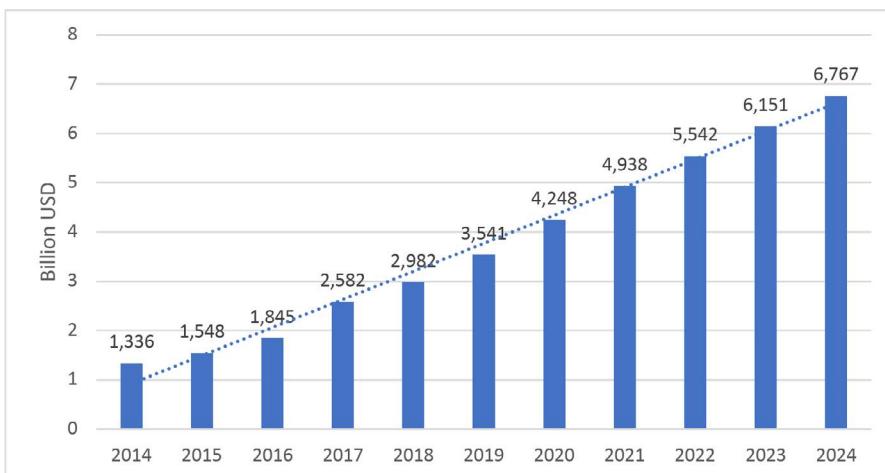
The 2014-2024 period was taken into account when comparing data and the size of the digital structure within the global trade volume. Digital trade, one of the most important dynamics radically changing the structure of global trade, is accepted today as one of the fastest-growing and most critical areas of the world economy. Thanks to the proliferation of the internet, the development of mobile technologies, and the rise of digital platforms, geographical borders have been eliminated, and the access of businesses and consumers to international markets has reached an unprecedented level.

This transformation process encompasses not only the online buying and selling of physical goods (e-commerce) but also the trade in digitally delivered services such as cloud computing, AI-supported services, and international data transfers.

In the era we are in, digital trade has become one of the main driving forces of global economic growth, covering not only online retail but also all transactions enabled by digital technologies, including cross-border data flows and digitally delivered services (OECD, 2019; Ministry of Trade, 2019).

The unique cost reductions and new business ecosystems (digital platforms) brought about by digital technologies have restructured global trade by increasing the scale, scope, and speed of international trade and overcoming geographical distances between economic actors (Abeliansky and Hilbert, 2017; Ferracane et al., 2020). “Digital trade, which surpasses the growth rate of traditional goods and services exports, has reached an estimated volume approaching \$5 trillion, representing one-quarter of global trade; this rapid growth creates new and inclusive global opportunities for micro, small, and medium-sized enterprises (MSMEs)” (IKV E-Bülten, 2024).

Graph 1- Development of Digital Trade in the World (2014-2024)



Source: <https://www.charle.co.uk/articles/ecommerce-statistics/#globalstats>

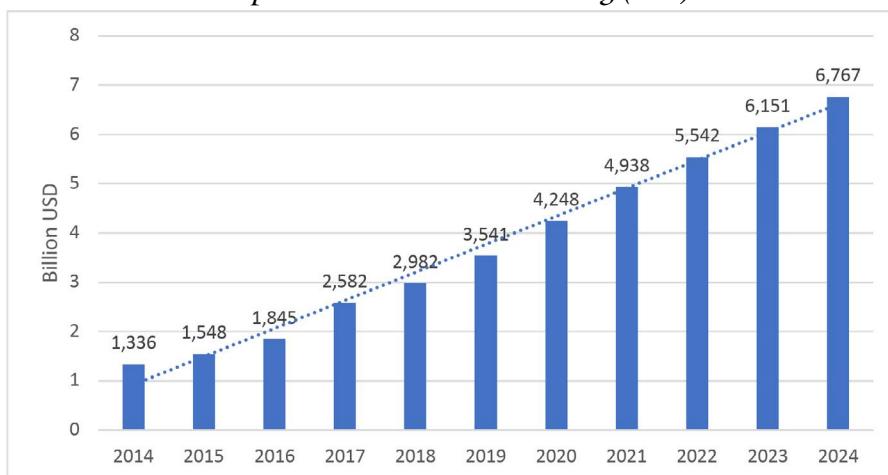
The data in Graph 1 clearly demonstrates the rise of global digital trade (e-commerce) volume with significant momentum during the 2014-2024 period. The volume, which was at the level of 1,336 billion USD in 2014, exhibits an approximately five-fold increase by reaching the level of 6,767 billion USD at the end of the ten-year period (2024 forecast). Particularly between 2020 and 2021, with the effect of the global pandemic and digitalization becoming a mandatory adaptation mechanism, the growth rate even surpassed the linear trend line. This situation indicates that e-commerce is not merely an economic facilitator, but a structural change dynamic that provides resilience against external shocks and permanently transforms consumer behaviors.

While this stable and strong growth of digital trade increases the pressure

on traditional retail sectors, it has brought about serious investment and innovation requirements in complementary fields such as logistics, payment systems, and cybersecurity. The high values reached by the digital trade volume signal that this sector has become one of the fundamental pillars of the global economy and that its share within the worldwide Gross Domestic Product (GDP) is continuously increasing.

Although a certain normalization trend is observed in the growth rate in the 2023 and 2024 forecasts in the graph, it predicts that the volume will maintain its upward trend. The 6,767 billion USD volume projected for 2024 represents a massive market size for the world economy and reinforces the critical importance of digital infrastructure investments in terms of development strategies. In the light of these macroeconomic indicators, in order for national economies to sustain their competitiveness, they need to develop policies that encourage the integration of even micro and small enterprises into digital platforms and ensure that trade is conducted effectively not only locally but also through cross-border digital channels. Thus, digital trade will be positioned as one of the main engines of sustainable economic growth.

Graph 2 - Global E-Commerce Ranking (2023)



Source: <https://www.charle.co.uk/articles/ecommerce-statistics/#globalstats>

The 2023 Global E-Commerce Ranking data clearly reveals the large-scale concentration in the global digital trade market and the overwhelming market dominance of certain countries. China, ranking at the top, possesses a market size larger than the total of all other countries with a volume exceeding \$3 trillion (\$3,023,660.00). The USA follows China with a

volume over \$1 trillion (\$1,163,490.00). The total market share of these two giant economies constitutes more than half of the global e-commerce ecosystem, demonstrating that digital trade is an indicator not only of technological but also of geopolitical and economic power balances. The fact that established economies such as Japan and the UK rank high in the list proves that developed countries have successfully converted their high consumption power and established digital infrastructures into e-commerce volumes.

The graph shows that certain economies in the Developing Countries (DCs) category have made a strong entry into the ranking. In particular, highly populated countries such as Indonesia (\$97,140.00) and India (\$118,900.00) have reached levels capable of competing with developed rivals such as Germany (\$97,320.00) and South Korea (\$147,430.00) in total volume. This situation indicates that the acceleration of smartphone penetration, the expansion of the middle class, and the adaptation of the young population to digital platforms in DCs create a great potential for e-commerce. Although the market size in these countries has not yet reached the leading actors, considering the current growth trends and population potentials, they have the potential to climb higher in the global ranking in the coming years. Therefore, the future growth trajectory of global e-commerce will largely depend on the speed of digital transformation in these developing markets.

5.2. Digital Trade in Türkiye

5.2.1. Current Status and Growth Trends of the Turkish Digital Market

Thanks to its robust digital infrastructure, young and tech-savvy population, and rapidly developing mobile penetration rates, digital trade in Türkiye has achieved a growth momentum above the global average in recent years. This dynamic sector has become a critical part of the national economy by encompassing not only online retail sales (B2C) but also B2B (business-to-business) transactions and e-exports.

One of the most concrete indicators of digitalization in the Turkish economy, the e-commerce volume, exceeded 3 trillion TL as of 2024, reaching 19.1% of the total trade volume and increasing its share in the Gross Domestic Product (GDP) to the level of 6.5% (Ministry of Trade, 2025).

These data clearly demonstrate the macroeconomic importance of e-commerce and its driving role in the country's economic growth. In 2024, the e-commerce volume in our country increased by 61.7% compared to the previous year and surpassed 3 trillion Turkish Liras. The number of transactions was realized as 5 billion 910 million units.

Retail e-commerce volume increased by 63.7% in 2024 compared to the previous year, reaching 1 trillion 619 billion Turkish Liras. The number of retail e-commerce transactions increased by 10.1% compared to the previous year, reaching 1 billion 850 million units. Between the years 2019-2024, the Compound Annual Growth Rate (CAGR) of the general e-commerce volume reached 85.66%, while the CAGR of the retail e-commerce volume reached 90.82% in the same period.

In USD terms, the e-commerce volume showed a 274% increase between the years 2019-2024. The e-commerce volume, which was 23 billion 940 million USD in 2019, increased steadily every year, reaching 77 billion 890 million USD in 2023, and 89 billion 580 million USD in 2024 with a 15% increase compared to the previous year. The rate of increase on a USD basis between 2019-2024 was realized as 274%.

In 2024, the share of domestic e-commerce volume within our Gross Domestic Product (GDP), announced as 43 trillion 410 billion 514 million TL by the Turkish Statistical Institute (TurkStat), was 6.5%. (www.ticaret.gov.tr Access Date: 15.09.2025).

5.2.2. Promotion of E-Exports and Digital Logistics Integration

Türkiye's strong growth momentum in digital trade is largely supported by the integration of SMEs in the domestic market into online platforms. The promotion of e-exports, which is one of the main objectives of national trade strategies, aims to facilitate direct access for these enterprises to global markets. According to Turkish Statistical Institute (TurkStat) data, the share of SMEs engaged in e-commerce within total exports has shown a significant increase in the last five years, yet this share lags behind developed economies (TurkStat, 2024). To close this gap, the Electronic Commerce Customs Declaration (ETGB) system, which covers small-volume and express shipments termed as micro-exports, has been popularized. This digitized customs clearance mechanism has accelerated cross-border retail sales, particularly to European and Middle Eastern markets, by reducing the rate at which SMEs encounter bureaucratic obstacles. The fact that the export volume conducted via ETGB showed an increase of approximately 45% in 2023 compared to the previous year is a concrete indicator that

digitalization transforms directly into logistics efficiency (Ministry of Trade E-Export Report, 2024).

The sustainability of e-exports depends on digital logistics integration. While traditional logistics networks focus on high-volume physical goods trade, e-commerce requires the fast and transparent management of small and dispersed shipments (parcel-based). In Türkiye, thanks to the API integrations established by international cargo and courier companies with e-commerce platforms, all processes from order placement to final delivery have become trackable in real-time. This situation, combined with warehousing and dispatch operations using Internet of Things (IoT) sensors, has reduced error rates and delivery times. However, for this integration to reach its full potential, the country's logistics infrastructure needs to be further supported by Industry 4.0 technologies such as smart warehousing systems and AI-supported route optimizations.

In conclusion, Türkiye's competitive power in global digital trade depends on its ability to increase the digital competence of SMEs and the technological capacity of the logistics ecosystem. These incentive mechanisms on a national scale should be supported by digital marketing and marketplace training programs aimed at SMEs, while also aiming to reduce cross-border payment systems and currency conversion costs. Digitalization should be positioned not just as a facilitator for Türkiye, but as a strategic transformation tool.

5.2.3. Regulatory Implications and Policy Needs of Digital Trade

The rapid growth created by digital trade in Türkiye brings along serious challenges for traditional legal and regulatory frameworks. At the forefront of these challenges is the management of international data flows. Global trade depends approximately 80% on cross-border data flows (McKinsey Global Institute, 2022). Although Türkiye strives to largely align with the European Union's GDPR through its personal data protection laws, data localization requirements can increase operational costs for international service providers and cause service interruptions. This situation carries the risk of negatively affecting the competitiveness of local digital platforms and SMEs in the global market. Furthermore, the monopolistic tendencies of global digital platforms are a main agenda item for national competition law authorities. The Competition Authority has conducted an increasing number of investigations against tech giants in recent years to prevent them from abusing their market dominance. The 25% annual increase in the number of these regulatory decisions (2020-2023 period) indicates that national regulatory interventions have become mandatory (Competition Authority Reports, 2024).

Another critical area is the fair taxation of digital services. While traditional tax rules are based on the physical presence of companies, digital platforms may show low or zero physical presence in the Türkiye market where they generate huge revenues. To remedy this problem, Türkiye has started implementing the Digital Services Tax (DST) as of 2020. This tax is collected on the gross revenues generated in Türkiye by global technology companies such as Google, Meta, and Amazon. The DST implementation has created a need to take policy steps compatible with the OECD's international tax reform efforts (Two-Pillar Solution - Pillar One and Two). Türkiye's participation in this global tax reform carries the potential to both protect the tax base and reduce international trade tensions. Consequently, the country's digital trade policies are required to establish a delicate balance between national security, fair competition, and the optimization of tax revenues.

6. Conclusion and Future Implications

6.1. Summary of Key Findings

This book chapter has demonstrated that global trade is undergoing a radical process of change under the influence of digitalization. Digital transformation has democratized the access of SMEs to global markets with the rise of e-commerce, rendered trade in services independent of physical borders, and made supply chains more transparent and efficient through technologies such as Blockchain (Section 3).

However, this transformation has brought along serious governance gaps and challenges. Data localization policies and data privacy regulations (e.g., GDPR) aimed at cross-border data flows have created new barriers in commercial transactions; at the same time, digital services taxes and global tax reform efforts have revealed the necessity of redistributing taxing rights (Section 4). Most importantly, global inequalities in digital infrastructure and competencies (the digital divide) increase the risk of developing countries being deprived of the potential benefits of digital trade.

6.2. Policy Implications

To maximize the potential of digital transformation in global trade and to reduce inequalities, decisive steps must be taken at national and international levels:

- International Cooperation and Standardization: It is imperative to rapidly establish internationally accepted common rules (data

governance standards, cybersecurity protocols) under the umbrella of the WTO or at the regional level, which will strike a balance between the liberalization and protection of data flows.

- Inclusive Development and Capacity Building: To overcome the digital divide, international aid aimed at digital infrastructure investments and technical capacity building programs (e-commerce skills, data analysis training) for developing countries should be prioritized.
- Ensuring Regulatory Compliance: Countries should focus on solutions such as the OECD/G20 Framework (Pillar One/Two) that ensure international consensus on the taxation of digital services, thereby creating a stable tax environment that will reduce trade tensions.
- Protection of Competition: The monopolistic tendencies of global digital platforms should be supervised by developing international competition law cooperation and fair access rules for platforms.

6.3. Future Research Areas

Since the interaction between digital transformation and global trade is a dynamic field, it is of critical importance that future research focuses on the following topics:

1. Qualitative Impact of AI on Trade Models: An in-depth examination of the concrete effects of generative artificial intelligence (Generative AI) on cross-border trade in services and intellectual property flows.
2. Measurement of Digital Trade: The development of new measurement methodologies, considering the inadequacy of traditional statistical methods in measuring the true value of digital trade in services (especially data flows and free services).
3. Resilience of Global Supply Chains: An analysis of to what extent digitalization makes supply chains resilient in the face of geopolitical risks or whether it renders the chain more fragile by creating new cyber risks.

Digital transformation draws an irreversible trajectory in global trade. The future will belong to economies that not only adopt this transformation but can also manage it with fair, transparent, and inclusive rules.

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