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An Analysis of the Impact of Sino-American Trade Relations on China's Economy from a Carbon Neutrality Perspective

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ABSTRACT

This study investigates the impact of the 2018 US-China trade war on China's economy and its pursuit of carbon neutrality. Amid trade tensions, China's 2020 pledge for carbon neutrality emerged as a strategic response to external economic pressures. By using SPSS and the Environmental Kuznets Curve model, this research quantitatively explores how economic growth correlates with environmental health. It examines how the trade war influenced China's industrial and technological advancements, inadvertently fostering emissions reduction and enhancing environmental awareness. The findings reveal that these adjustments not only mitigated short-term economic challenges but also prompted shifts in employment and heightened public consciousness about environmental issues. This analysis contributes to understanding the intricate balance between trade, economic growth, and environmental sustainability, offering policy recommendations to harmonize these elements globally.

KEYWORDS

Sino-American trade war; Carbon emission; Carbon neutrality; Economy Growth

1. INTRODUCTION

The origins of the trade dispute date back to 2018, when US President Donald Trump directed the US Trade Representative to impose tariffs on Chinese imports totalling up to $60 billion. This policy was aimed at forcing China to modify its trade practices, which were deemed "unfair", including contributing to the widening of the U.S. trade deficit and forced technology transfers. On 6 July 2018, in direct response to China's trade policies, the U.S. began to impose additional tariffs of 25 per cent on $34 billion of Chinese goods. In response, China's Ministry of Commerce (MOFCOM) then reciprocally imposed additional 25% tariffs on $34 billion worth of American products, that include as soybeans and other products with the largest U.S. exports to China (Gechev, 2021; Khan & Khan, 2022).

In 2019, the Yuan broke through 7 against the dollar, further fueling trade tensions and prompting the US to increase tariffs on China (Long et al., 2022). Despite the World Trade Organization ruling in 2020 that the Trump administration's tax increases were illegal, the US government has not stopped its measures to increase tariffs. This series of events not only exacerbated the economic friction between the US and China, but also had a significant effect of the world economy.

Carbon neutrality has become a focus of competition among global powers. The carbon neutrality target set by China is not only crucial for domestic economic transformation, but also a key factor in the success of international cooperation and global climate governance. In June 2015, Chinese Premier Li Keqiang announced during his visit to France that a peak in China's carbon dioxide emissions is anticipated by 2030, marking an important step towards China's future goal of "carbon neutrality". Following this, in September 2020, General Secretary Xi Jinping further clarified China's climate commitment by stating that China wants to achieve carbon neutrality by 2060 and reach a peak in carbon emissions by 2030. This commitment not only provided China with the first explicit target for the expected reduction of global warming, but also one of the most ambitious climate commitments to date on a global scale. Based on its current trajectory, China's "carbon neutral" strategy will be implemented in three steps: firstly, to ensure that carbon peaks by 2030; secondly, to rapidly reduce carbon emissions by 2045; and lastly, to achieve deep decarbonization and full carbon neutrality by 2060. This shift is particularly important as China transitions from a phase of economies of scale and low-cost production to high-quality development (Shi et al., 2023). As the world's second-largest economy, China has not only maintained positive growth in driving economic growth, but has also taken advantage of global opportunities to actively promote the optimization and upgrading of its industrial structure.

1.1. Research Questions

This thesis aims to provide answers to the concerns about the examination of Sino-American Trade War Relations' effects on China's economy from a carbon neutrality position. Therefore, the research questions of this thesis could be:

(1) Which aspects of China's trade with the United States are most important to the country's economy?

(2) How does the US-China trade war affect the achievement of China's carbon emissions and carbon neutrality targets?

This study aims to explore the evolution of the U.S.-China trade relationship has affected China's economic performance, with a particular focus on how carbon-neutral policies have contributed to the economic growth of China. The study will analyze which aspects of international trade with the United States contribute most to China's economic growth and explore how to effectively accelerate China's carbon neutrality goals while promoting economic growth. By delving into the interactions of these trade sectors and policies, this study aims to reveal the complexity of economic interactions between the United States and China and explore strategies for sustainable development in the future. In addition, the authors will examine China's political economy and policy dimensions, considering how China can leverage its resource and energy strengths - as a world power - to maximize the benefits of the US-China trade war. This analysis will explore how China has strategically adjusted its economic structure and policies to optimize its competitiveness and influence in the global economy. The author's primary objective is to provide readers a general knowledge of the idea of carbon neutrality and how it applies in China. The methodology uses the SPSS for quantitative analysis of data from official websites. The results of the analysis will provide answers for research questions and conclude findings.

1.2. The Hypotheses of Study

This study explores the potential impact of the Sino-American trade war on China’s carbon neutrality goals. Thus, the hypotheses could be:

H1: Increased Chinese direct investment (FDI) in the United States enhances China’s economic growth.

H2: The Sino-American war has accelerated China’s progress towards carbon neutrality.

As China’s direct investment (FDI) in the United States increases, China's economic growth is expected to be enhanced. This hypotheses is predicated on the potential positive impacts that investment flows can have on the economic output of the recipient nation, particularly through mechanisms such as technology transfer, enhancement of management skills, and integration into the global market (H1). Moreover, the US-China trade war has, to a certain extent, accelerated China's progress towards carbon neutrality. This acceleration is likely facilitated by prompting policy adjustments, stimulating technological innovation, and influencing the transformation of industrial structures, particularly within the energy and manufacturing sectors (H2).

1.3. Motivation of Study

The motivation for this study stems from the authors' deep concern about the current international economic situation, especially the wider effects on the international economy of the trade war between the two biggest economies in the world, China and the United States. The economic conflict between the US and China is not limited to the two nations as globalization continues; rather, its repercussions might alter other nations' economic policies as well as the dynamics of international markets. China's announcement of a 2020 carbon-neutral aim has shown the government's will to meet this challenging objective by modifying its systems and enacting new regulations, irrespective of international skepticism. Research on how to achieve environmental sustainability with rapid economic development can benefit greatly from the establishment of this strategy and its possible global consequences. By delving into the impacts of the US-China trade war on China's economic policies, particularly carbon neutrality, this study aims to understand how this global issue is reflected in China's policymaking and to explore how China can leverage its resources to not only address international challenges, but also to take a leadership role in global environmental governance. Future worldwide economic and environmental strategies are influenced by the study, which is crucial for comprehending how present international economic and environmental policies interact. Organization of the Text.

2. LITERATURE REVIEW

The prefix 'sino' is derived from the Latin word 'Sinae', which has long been used in English to form a terminology to describe China and its international interactions. The use of 'Sino' not only avoids linguistic redundancy, but also adds professionalism to the expression, making the academic discussion more precise. In addition, the use of 'Sino' as a prefix helps to emphasise specific cultural or historical contexts associated with China, especially when describing complex transnational relationships (Nymalm, 2022).

2.1. Macroeconomic Background

The Sino-US trade war, which began in 2018 which marks a major shift in US history towards global market integration. By the end of 2019, tariffs levied by the US on Chinese imports totaled over $350 billion, prompting China to retaliate with tariffs on about $100 billion in U.S. exports. The trade conflict is notable for its suddenness and scale, and represents a significant departure from the United States' longstanding role in driving down global tariffs (Fajgelbaum & Khandelwal, 2022).

Research on the economic effects of the trade war shows that US consumers have paid higher prices as a result of tariffs, leading to a decline in aggregate real incomes in the US and China, although not by much compared to their GDP. Studies using a variety of data and methodologies have shown that tariffs are fully passed through to tariff-included import prices, meaning that importers rather than exporters absorb the cost of tariffs. This complete pass-through contradicts the expectations of the pre-trade literature, which generally found incomplete pass-through, indicating that importers could influence world prices through tariffs. The trade war has led to a major trade reallocation, with both countries reducing imports from each other and seeking alternative sources. This reconfiguration of trade flows has been accompanied by changes in local labor markets, particularly in the United States, where industries affected by China's retaliatory tariffs have experienced employment declines. The adjustment within the US economy has been uneven, with some sectors benefiting from import protection and others suffering from increased input costs and reduced export opportunities due to retaliatory tariffs (Bekkers & Schroeter, 2020).

Simulations in general equilibrium models that combine estimates of tariffs' effects on prices, trade flows, and sectoral employment suggest that the overall welfare effects of the trade war on the United States and China, while negative, are small relative to GDP. These findings highlight the complexity of the economic effects of trade wars, highlight the uneven distribution of costs across sectors, and point to the importance of considering both direct and indirect effects when assessing the impact of trade policies (Fajgelbaum & Khandelwal, 2022).

Wang, Pang, and Li (2019) deeply analyzed the changes in the Comparative Advantage Index (RCA) to determine the trade structure between China and the US. And explored the root causes of the trade war and its macro impact on China's economy. The article points out that the distribution of comparative advantages between China and the United States in trade is different. China has a strong comparative advantage in some manufactured goods and labor intensive products, while the United States has an advantage in capital and technology intensive products. This structural imbalance is one of the important reasons for trade friction between the two sides. The study further reveals the multiple causes of the Sino-US trade war, including China's "encourage exports and restrict imports" policy, US restrictions on high-tech exports, differences in statistical methods, and the gradual shift from complementary to competitive trade relations between China and the US. with China's rapid development in the high-tech sector and the with the "Made in China 2025" plan in place, China and the US are competing more fiercely in the market for technologically advanced goods.

The literature review in this section will explore in depth the impact of the Sino-US trade war on the economic conditions from the three key dimensions of trade balance and growth, investment liquidity, and energy and resource efficiency. First, the Trade Balance and Growth section will examine how the trade war has reshaped the trade balance and explore the long-term impact of this rebalancing about economic expansion in both countries. Second, in terms of investment liquidity, we will analyze how the trade war has affected cross-border investment flows, and how this change in turn affects the economic development and innovation capacity of both countries. Finally, the Energy and Resource Efficiency section will look at the effect of the trade war on energy consumption and resource efficiency in both countries, particularly the challenges and opportunities in pursuing sustainable development and reducing the environmental footprint to lay the foundation for achieving carbon neutrality.

2.1.1. Trade balance and growth

In 2010, China's economy rose to the second rank in the world, the trade relationship between the U.S. and China and its impact on the global economy have become a focal point of international attention. The trade conflict stems from the United States' pursuit of trade protectionism during the Trump administration, when the United States faced various internal problems, such as trade imbalances with its trading partners, income inequality, and huge government budget deficits. Imports of washing machines and solar panels were subject to steep taxes from the US government, which then implemented tariffs on imports of steel and aluminum from its trade partners. After revising the Korea-US Free Trade Agreement and the North American Free Trade Agreement, the administration has focused on the trade dispute with China, a process that is still ongoing, threatening to impose 25 percent tariffs on all imports from China and vice versa. In addition, the U.S. government plans to impose a 25 percent tariff on imported cars and parts from all countries, despite a six-month extension starting in May 2019. Fortunately, the two countries reached and signed a trade agreement in January 2020 to resolve the trade conflict. However, because the interests of the two sides do not perfectly match, there is a lot of uncertainty about the implementation of the trade agreement (Park, 2020).

A study by Žemaitytė, and Urbšienė (2020) delves deeply into the macroeconomic effects of trade tariffs during the Sino-US trade war and notes that COVID-19 has lessened the effects of the trade war slightly. The study’s findings indicate trade tensions between China and the US have increased the US trade deficit and compelled the US to import more goods from other nations, which has had a significant impact on the US agriculture and auto industries in addition to reducing trade intensity and welfare between the two nations.

The U.S. trade deficit grew, reaching a nine-year peak of $566 billion in 2017, marking a 12.1% increase and equivalent to an increased from 2.7 percent in 2016 to 2.9 percent of GDP. Faced with this challenge, the Trump administration explored various economic measures, including currency adjustments and tariffs, to mitigate the deficit, particularly with China. Ultimately, the administration leaned towards directly reducing the trade deficit through the imposition of tariffs. This approach aligned more closely with American strategic objectives and allowed for targeted actions against Chinese exports. The preference for tariffs over currency adjustments was driven by the limited impact and lack of complete control over exchange rate adjustments (Wei, 2018).

While some economists argue that protectionist policies may extent foster robust growth in the global economy, Thoms (2019) emphasized that there are no winners in a trade war. In the United States, trade expansion increased household GDP by $18,131 and per capita GDP by $7,014 between 1950 and 2016. On the other hand, the trade disputes of 2018 resulted in higher import costs, which ultimately caused a loss to producers and consumers of 0.37% of GDP, with welfare losses coming in at 0.04% of GDP. Families with middle-class and lower-class incomes in the US have hardly noticed the significant economic expansion caused by free trade. Protectionist policies can protect some domestic job sectors in the United States, but tariffs increase the cost of trade, which lowers the disposable income and spending power of every household. In the latter part of 2018, U.S. goods exports fell by $15.28 billion due to these measures alone. Moreover, Cerutti, Gopinath, and Mohommad (2019) conducted a study of the impact on producers shows those producers directly affected by the tariffs, as well as those who rely on these goods as intermediate inputs are also vulnerable. The market of the price of traded goods causes the diversion effect of trade. U.S. soybean exports to China declined significantly in 2018, reflecting the direct impact of market segmentation. The United States and Brazil, as major soybean suppliers to China have reduced soybean exports from the United States to nearly zero due to tariffs, while Brazil's export have increased, triggering a fall in soybean prices in the United States and a rise in Brazilian soybean prices. Although prices eventually converged, U.S. soybean farmers suffered as a result, while Brazilian growers benefited from trade diversion and market segmentation.

In 2022, commerce in products between China and the United States broke previous records, despite increasing discord among the two countries. China is the United States' largest import source and its third-largest trading partner in terms of value, according to this report's analysis of the US Bureau of Economic Analysis (BEA), China Customs Statistics and the US Census Bureau data (Huld, 2023).

A critical open question is despite the peak in trade volumes, there is a lack of precise research and surveys to confirm whether people's daily living levels have increased compared to before the trade war. The widespread online downgrade of private consumption raises questions about the current growth model, suggesting that growth may be confined to a small number of capital groups. If the public's daily life consumption fails to reflect the positive trend of economic growth, it may reveal the deep irrationality in the resource allocation mechanism. This phenomenon, especially in the context of trade wars, raises questions about the connection between the substance of economic growth and the well-being of the broad population, as well as the effectiveness of current economic policies in promoting equitable distribution off resources.

2.1.2. China Foreign Direct Investment (FDI) into U.S.

China's regulatory framework has changed over the last 20 years from one that was restrictive to one that is supportive of foreign investment. The Chinese government launched the "going out" strategy in 2000 with two main goals in mind: first, to create an internal regulatory framework that promotes competition among Chinese companies globally to form a network that provides the country with access to all resources, including know-how; and second, to support Chinese investments abroad that support the national development goals, especially those pertaining to increasing exports, obtaining natural resources, and diversifying the economy (Globerman & Shapiro, 2009).

By analyzing state-level panel data from 2006 to 2016, Lu and Biglaiser (2020) explore the political determinants of Chinese direct foreign investment (FDI) into the United States. The study found that states run by Republican governors are more likely to attract Chinese FDI, particularly greenfield investment than U.S. run by Democratic governors, a finding that underscores the significant impact of party policies on FDI flows. The study also reveals that in the high-tech sector, the role of partisan politics is limited by U.S. national security concerns and China's goal of acquiring technology. Specifically, between 1997 and 2017, Chinese investment in the United States increased more than 200-fold, from about $182 million to nearly $40 billion. In addition, the paper compares the FDI of states with Republican governors with that of France in the United States, and finds that states with Republican governors are also more likely to attract FDI from France. The study provides important insights into how political factors influence Chinese FDI in the United States, while also highlighting the significance of national security while deciding which foreign investments to make in the high-tech industry.

As the trade war between China and the United States intensifies, both sides have taken legislative steps to defend their economic interests. In 2018, the Trump administration fought back by passing the Foreign Investment Risk Review Modernization Act (FIRRMA) to strengthen the Committee on Foreign Investment in the United States (CFIUS) 's ability to review investment cases. The move focuses on Chinese investment practices, particularly those related to the "Made in China 2025" plan, and marks them as a particular concern. FIRRMA enforcement has led to greater scrutiny of Chinese investments in critical technology and infrastructure in the United States, effectively blocking or cancelling a number of deals, particularly those involving dual-use technologies. The move is aimed at guarding against potential security threats and has led the US to be more cautious about issuing visas to Chinese government-sponsored science, engineering and doctoral students. At the same time, China has also moved quickly to accelerate the legislative process of the Foreign Investment Law (FIL), which was formally adopted in 2019. The law is seen as an olive branch by China in the tense trade talks and contains a number of liberalization measures aimed at moving the process forward. However, the law also includes provisions allowing for expropriation and retaliation, underlining China's resolve to act independently in response to global economic issues. In response to the increased powers of CFIUS, China has implemented its own new national security review mechanism, which is seen as a direct response to FIRRMA's measures to review foreign investments that may have national security implications (Bayer, 2022).

The Trans-Pacific Partnership (TPP) is a multilateral free trade agreement covering a wide range of trade and economic issues, which was created in 2008 to deepen economic ties among member countries and promote trade and investment by reducing tariffs and eliminating trade barriers. Since the reform and opening up, China's economic strategy and foreign policy have undergone fundamental changes, transforming from a relatively passive socialist country on the international stage to a dominant country in global trade and investment flows. This change has been accompanied by a major shift in attitudes and policies towards foreign direct investment (FDI), from initial restrictive measures to encouraging and promoting FDI, in particular through the implementation of the "going out" strategy, which aims to promote domestic economic development and expand international influence through overseas investment. In 2017, US President Donald Trump announced that the United States would withdraw from the TPP, a decision that has far-reaching implications for the future of the agreement. The US withdrawal provides China with an opportunity to promote its own regulatory model for FDI through its multilateral and bilateral agreements, particularly in the Regional Comprehensive Economic Partnership (RCEP) and its cooperation with the Association of Southeast Asian Nations (ASEAN). The Chinese model focuses more on striking a balance between investor protection and host country development, in sharp contrast to the US model (Zreik, 2023).

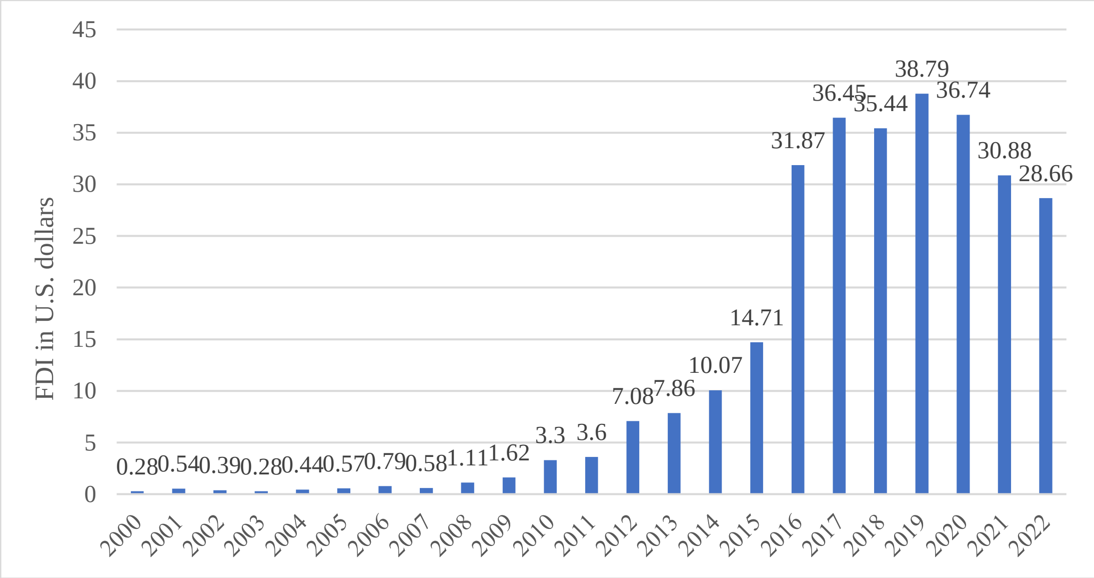

Figure 1. Foreign direct investment from China into the U.S. from 2000 to 2022

Source: Statista.com, Foreign direct investment from China into United States from 2000 to 2022, 2024.

According to the figure 1, at the beginning of the 21st century, Chinese enterprises gradually increased their interest in investing in the US market. From 2000 to 2009, this investment relationship showed a steady growth trend, with the amount of investment increasing from $28 million in 2000 to $162 million in 2009. The year-over-year increase over this period reflects China's expanding role on the global economic stage and the growing confidence of Chinese companies in the investment climate in the United States. Moving forward from 2010 to 2016, we witnessed a significant jump in Chinese direct investment in the United States, from $330 million in 2010 to $3.187 billion in 2016, the investment reached an unprecedented high. This growth not only marks a positive adjustment of Chinese enterprises' outbound investment strategy, but also reflects their deep participation in key industries such as high-tech, financial services, energy and real estate, highlighting the strategic layout of Chinese enterprises in the context of globalization. By 2017, Chinese investment in the United States reached a historic peak of $3.645 billion. This is the culmination of Chinese companies' strong interest and outbound investment in the U.S. market before the start of the trade war between China and the United States. However, from 2018 onwards, while the level of investment remained high due to the impact of the US-China trade war, it fell back somewhat in comparison. By 2022, investment has fallen to $2.866 billion, a period closely linked to the instability of the world landscape due to COVID-19.

In response to increased scrutiny of Chinese foreign direct investment (FDI) by the United States on national security grounds, China has adopted a new foreign investment law and a national security review system aimed at allaying concerns of the international community, especially the United States, and creating a more predictable investment environment to attract foreign investment (Health, 2018)). At the same time, these measures also hint at China's willingness to take unilateral action if necessary. By promoting the Belt and Road Initiative and the Regional Comprehensive Economic Partnership (RCEP), China aims to expand its economic influence in the Asia-Pacific region and the world, which is seen as a strong response to the US Asia-Pacific strategy and shows China's determination to seek to increase its influence and leadership in the global economy. Despite the promise of fair competition in accordance with the foreign investment regulations, the focus on national security scrutiny and the potential for state intervention have kept doubts about the true openness of the Chinese market. Since the 1890s, however, China has gradually increased the number of visa-free countries, which has been mutually beneficial for many.

2.2. Carbon Emissions in China

China was the world's leading emitter of CO2 as a developing nation, but it is now surpassed by Germany, Poland, and Estonia in terms of CO2 emissions per person. Since quick and sustainable development depends on environmental conservation, China has taken some steps in this direction (Ma, 2023). Compared with 2019, the growth rate of China's regional carbon emissions in 2020 has decreased by 50%, but due to COVID-19, most regions will have indirect lockdown, which causes enterprises to stop production and greatly reduce carbon emissions. However, in 2021, the lockdown degree will be weakened. The country's total carbon emissions reached 11,295.08049 mt, a record high (Xu et al., 2024).

Faced with this challenge, the Chinese government has adopted active policies and measures to control and reduce carbon emissions. First, China has ramped up investment in renewable energy, pushing for clean energy such as wind, solar and water to reduce its dependence on fossil fuels. By the end of 2020, China leads the world in installed capacity of both wind and solar power. These efforts have slowed the growth of carbon emissions to some extent. Chinese government has formulated the "Made in China 2025" plan, which aims to promote the green development of the manufacturing industry through technological innovation and industrial upgrading. Reduce the environmental impact of industrial activities by improving energy efficiency and promoting green production methods. In addition, China has set up a carbon emission trading market to encourage enterprises to reduce emissions through the market mechanism, which is one of the important measures for China to achieve its carbon emission reduction target.

Despite these measures, China's carbon emissions remain under pressure, driven by rapid economic growth. Therefore, in the future, China needs to further strengthen its environmental policies while maintaining economic growth, especially in improving energy efficiency, increasing green investment, promoting clean energy use and technological innovation. In addition, strengthening international cooperation, learning and introducing foreign advanced carbon reduction technology and management experience is crucial for China to achieve the goal of carbon neutrality.

2.2.1. Status of carbon neutrality in China

Numerous studies have highlighted China's significant efforts and strategies to combat climate change, including establishing carbon trading policies and committing to carbon neutrality by 2060 (Zhao, Ma, Chen, Shang, & Song, 2022). Meanwhile, China can reach its carbon peak by 2030 through diversified strategies to address climate change, including energy transition, development of renewable energy, enhancement of carbon sink, promotion of key technologies, and formulation of relevant policies (Wang et al., 2021). The need to adopt and promote low and zero-carbon technologies and improve energy efficiency to achieve global net-zero emissions by mid-century. The Asia-Pacific region faces considerable challenges due to its high dependence on fossil fuels and low levels of economic development compared with development regions (Zhao et al, 2022). Zhao et al. (2022) explored China has made substantial progress in its low-carbon development and energy transition and could reach carbon neutrality by 2060 through the large-scale deployment of renewable energy efficiency and the launch of low-carbon projects. Therefore, China not only needs to continue its current strategy, but also needs to overcome the challenges in the process of decarbonizing its economy through technological innovation and international cooperation, which will prepare the country to assume global climate governance.

The literature on carbon neutrality has highlighted several suggestions to forster China’s green transition and strategies for China to achieve Carbon Neutrality. Promote the investigation and commercial use of carbon capture, utilization, and storage technology, and encourage the creation and implementation of green building standards by promoting electric cars (Zhao et al, 2022). China has become the world's leading manufacturer, consumer, and producer of electric car batteries as well as electric vehicle production (Chu, Cui, & He, 2023). The rise of Chinese electric car makers such as BYD and NIO marks a radical change in the global auto industry landscape. Meanwhile, China is overtaking Japan as the world's largest auto exporter with Chinese company BYD overtaking its rival Tesla in the last quarter of 2023 (Mohammed, 2024). The paper also mentions that China still has a long distance from the carbon neutral development of European and American countries, and the main development path to achieve the goal of carbon neutrality is mainly due to the relatively low level of economic development and the immaturity of low-carbon zero-carbon technology. Therefore, China has formulated a first step plan to reach the peak of carbon dioxide exploration and emission by optimizing the energy mix between 2021 and 2030 (Zhao et al, 2022). China has made remarkable progress in reducing its carbon intensity since 2005, with a 48.4% reduction in carbon intensity by 2020, reflecting the country's successful decoupling from carbon emissions in the course of its economic growth. In promoting clean energy, China has contributed to increasing clean energy supply and reducing carbon emissions through large-scale construction of wind and solar photovoltaic power generation projects. These projects not only optimize the energy mix, but also promote the development and application of renewable energy technologies. In addition, China has promoted shared bicycle and electric vehicle services in several cities, improving the cleanliness of urban transportation and promoting the popularization of low-carbon lifestyles. These measures reflect China's active exploration and practice in low-carbon development and environmental protection, and make important contributions to the realization of carbon neutrality (Zhao et al., 2022). Global challenges including climate change and environmental protection are having an increasing impact on food security, population migration, socioeconomic development, human health, and terrestrial and marine ecosystems. The Chinese government, which is the biggest greenhouse gas emitter in the world, has suggested a fundamental strategy for achieving carbon neutrality that is centered on strengthening top-level design, maximizing institutional advantages, enhancing current laws and regulations, and national planning. To combat climate change and promote sustainable development, China is adopting strategies to optimize its industrial structure and revise its legal and regulatory system. This includes formulating low-carbon development and Plans for implementing carbon peaking in critical industries including energy, steel, and non-ferrous metals, and promoting the transformation of these industries to energy conservation and carbon reduction. In order to promote the achievement of carbon peak and carbon neutrality targets, the government is constantly updating and upgrading pertinent laws and regulations, such as the Energy Conservation Law and the Renewable Energy Law. The measures aim to guide industrial transformation and upgrading through legal and administrative means and ensure that China's economic development is in harmony with environmental protection goals (Wang et al, 2022).

2.2.2. Carbon emission and climate change

With the deepening of global economic integration, the impact of international trade on the environment, especially carbon emissions have been widely concerned. Some research indicates that after the trade conflict between the United States and China, carbon emissions decreased for both parties. Despite the sharp decline in bilateral trade caused by the Sino-US trade war, China's overall imports and exports have not changed much; China's export emissions have not changed significantly, import emissions have decreased slightly, and net emissions have increased. In addition, China's exports are still concentrated in energy-intensive industries, and trade changes pose challenges for China to balance climate and trade needs, but energy - and technology-based Sino-US cooperation can help China cope with climate change in the wake of trade conflicts (Chou, Wang, & Dong, 2021). According to a study by Lu et al. (2020), there is complexity and variation in the way that the US-China trade war has affected global carbon emissions. Global economic activity may slow down as a result of a trade war, momentarily lowering carbon emissions in some areas, but overall, carbon emissions may rise as a result of the conflict. Furthermore, economies of scale are causing some developing nations—like Vietnam, Russia, and India—to emit more carbon dioxide, underscoring the issue of global industrial shift and environmental burden shift. On the other hand, countries such as South Korea, the United Kingdom and France enjoy a reduction in carbon emissions due to structural effects, which indicates that technological progress and industrial restructuring have a positive effect on reducing environmental pressure. It is worth noting that while China and the United States, as the main players in the trade war, have suffered losses in production and their total carbon emissions have declined, their carbon intensity has risen, revealing the environmental costs of pursuing economic growth while increasing per unit of output.

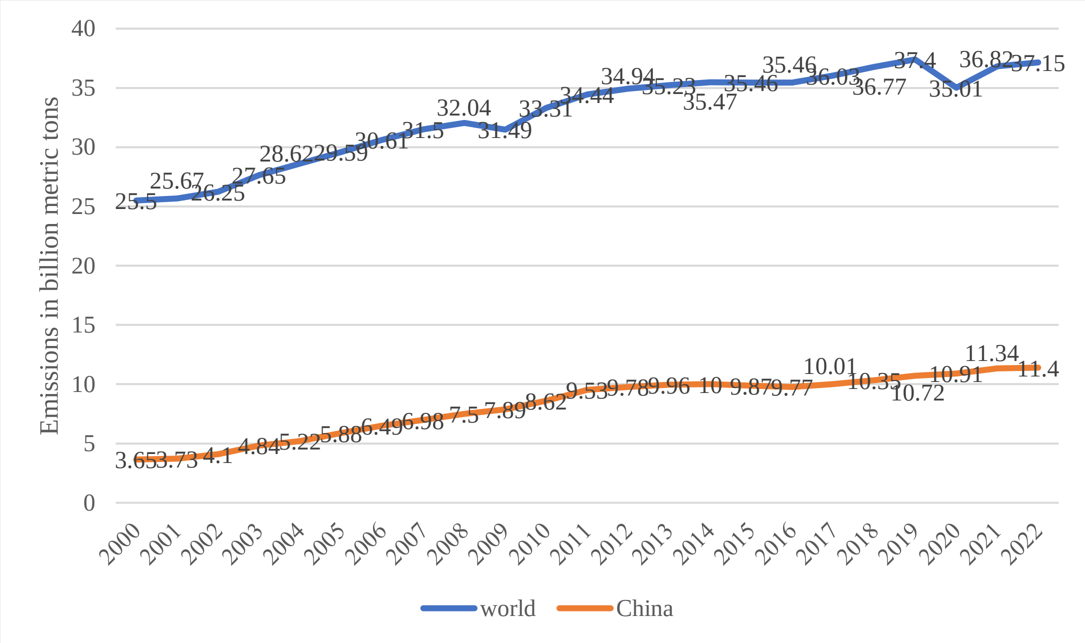

Figure 2. Carbon emissions between the world and China from 2000 to 2022

Source: World Resources Institute, 2024.

Based on Figure 2, in the year 2000, China's carbon emissions were considerably lower than the global average. However, as the nation's economy expanded rapidly, carbon emissions have increased a lot. From 2011, a heightened collective consciousness towards environmental protection took hold, which tempered the rate of emissions increase, albeit without reversing the upward trend. Following China's commitment to achieving carbon neutrality in 2020, the chart up to 2022 shows that the country 's carbon emissions are beginning to plateau.

While environmental pressure in the United States is evident in the higher nutritional load of agricultural output and the rising need for blue water, the main cause of China's increased carbon emissions is the export restructuring brought on by the trade war. These modifications show how trade policies between nations have a significant impact on environmental sustainability in the globalization period. China's government must adopt policies geared toward a green premium and boost funding for clean energy technology research and development in order to strike a balance between the country's growing commerce and environmental protection requirements. In order to reduce environmental constraints, the United States should invest in technology that manage nutrient contamination and increase irrigation efficiency, as well as reinforce its regulatory framework (Zhou, 2023).

2.2.3. Green technology and innovation

Numerous studies have examined data from various Chinese provinces or areas using various models; one such study examined the effect of green technology innovation on carbon intensity. In discussing the relationship between green technology innovation and industrial structure upgrading and their impact on carbon emissions, using data from 30 Chinese provinces between 2008 and 2020, Gao et al. (2022) examined the influence of green technology innovation on carbon emissions within the framework of industrial structure upgrading using fixed-effect and mediating-effect models. In another study, the paper analyzed the relationship between provincial green innovation in China and regional carbon intensity based on panel data from 30 provinces in China from 2007 to 2019 (Chen, 2023). In addition, a study within the context of research on China's High-Speed Railways (HSRs) across 286 prefectural-level cities from 2007 to 2018, it was discovered that the expansion of HSRs not only significantly fosters green technology innovation in the local area but also exerts a significant effect on surrounding regions (Chen, 2022). A government report discusses green low-carbon development as an important direction for global economic and social development, as well as the important implications of policy compatibility and high-quality development in China's intention to achieve carbon neutrality. Around the market mechanism of carbon pricing, China plays an important role in global climate cooperation in the new era (China Council for International Cooperation on Environment and Development, 2023).

The study did not mention any specific green technology cases to reduce carbon emissions but said that the main scientific and technological means to improve or create technology that can save resources consumption and minimize the impact on the ecosystem. By promoting the development and application of green technology innovation, it can effectively promote the optimization and upgrading of industrial structure, and achieve a win-win situation between economic and social development and environmental protection (Gao et al, 2022). In the research of Chen et al (2023) Firstly, the dynamic evolution and spatiotemporal distribution of green technology innovation and carbon intensity in China's provincial level are discussed. Then, the nonlinear spatial Durbin model (SDM) is used to explore the impact of green technology innovation on carbon intensity. There is a significant spatial aggregation phenomenon of green technology innovation level and carbon intensity in China's provincial level. The direct impact of green technology innovation on regional carbon intensity shows a significant "inverted U-shaped" relationship, that is, when the level of green technology innovation is low, it will promote carbon emissions, and when the level of green technology innovation reaches a certain level, this promoting relationship will change to inhibiting relationship. From the perspective of interregional spillover effect, green technology innovation also presents an "inverted U-shaped" nonlinear impact on carbon emissions in neighboring regions, that is, the impact of green technology innovation on carbon emissions in neighboring regions first promotes and then inhibits. In another way, high-speed rail improves the mobility of the population, reduces the cost and time of communication between innovative talents, and promotes the dissemination of knowledge and the formation of new knowledge, especially knowledge related to green technologies. This flow of talent helps to form innovative collaborative networks between different cities and accelerates the innovation and application of green technologies. The construction and operation of high-speed rail has enhanced the connectivity and visibility of cities, prompting local governments to improve environmental quality and create a good urban image. It is found that the high-speed railway not only promotes the green technology innovation of the cities in which it is located, but also has a positive spatial spillover effect on the surrounding cities. This shows that the development of high-speed rail can contribute to the formation of green innovation synergies within the region and promote environmental protection and sustainable development in the wider region (Chen et al, 2022).

In the study of the government report, in the context of global carbon neutrality, China is working to implement the global biodiversity conservation framework into a national action plan. At the same time, the government is also actively dealing with the problem of offshore environmental pollution and has taken a series of control measures. In the process of urbanization, China is promoting the urban green transformation strategy, aiming to build a more sustainable urban living environment. From an international perspective, the green transformation of communities and the road to decarbonization of cities are becoming the key support for China's urban development in the new era. Through such efforts, China aims to contribute its wisdom and strength to the construction of global ecological civilization and present a future picture of harmonious coexistence between humanity and nature (CCICED, 2023).

These studies, which have examined the central role of green technology innovation in industrial upgrading, have done so on the basis of data analysis. They have shown that the implementation of regional green management measures can lead to new directions in industrial development by fostering economic growth and sustainable development. In particular, the government report more comprehensively emphasized that China as one of the most dominant and powerful countries in the world should shoulder more social responsibilities and make greater contributions to the global environment and economic development. This point of view emphasizes China's critical role in advancing global environmental governance and sustainable economic development, which helps to realize global carbon neutrality, as well as the significance of green technology innovation and sustainable development strategies in the context of globalization. While green technologies are recognized as an effective way to reduce carbon emissions, existing research often ignores the cost and economic feasibility involved in implementing these technologies. Future research is necessary to explore the cost-effectiveness of various green technologies, including their initial investment, operation and maintenance costs, and long-term economic benefits. At the same time, the existing research mainly focuses on technological innovation and policy promotion, and insufficient consideration is given to the role of social and cultural factors in the adoption of green technologies. In fact, the economic base has a decisive influence on the superstructure. In China, for example, new green technologies are easier to implement in cities with good infrastructure and cultural heritage, where residents tend to have higher education levels. However, in some less developed areas, basic living security has not been solved, and the discussion and implementation of new green technologies naturally face more difficulties. Therefore, future research should consider economic, social and cultural factors more comprehensively in order to promote the widespread adoption and effective implementation of green technologies.

2.2.4. Carbon peaking and carbon neutrality pathways

In the face of the growing challenge of global climate change, the Paris Agreement has set an ambitious goal of limiting the global average temperature rise to less than 2 °C above pre-industrial levels, and striving to further limit the rise to 1.5 °C. In this context, CCUS technology is particularly important. CCUS technology is include carbon capture, utilization and storage. The technology is designed to separate carbon dioxide (CO2) from industrial or energy production processes and transport it to a dedicated storage site for long-term underground storage, thus breaking the link between it and the atmosphere. CCUS technology offers a practical way to combat climate change and help the world meet its carbon reduction targets. Many studies of China's path from carbon peaking to carbon neutrality have highlighted the importance of CCUS technology.

Li (2023) highlighted the key role of CCUS technology in achieving China's "carbon peak" and "carbon neutral" goals, suggesting that this technology offers the possibility to achieve low carbon, zero carbon and even negative carbon solutions. China is a global leader in CCUS technology research, which focuses on improving geological storage technology and optimizing oil and gas recovery rates. As China enters the era of climate economy, it is faced with green reform with both opportunities and challenges. By reviewing the previous literature on China's carbon peak, this article explains that China has entered the era of climate economy and is facing green reform with both opportunities and challenges. As a complementary technology path to carbon neutrality, CCUS technology has the potential to be applied in specific industries and regions, despite the cost and technical challenges. For example, through the carbon pricing mechanism, the cost of carbon emissions will be raised, and enterprises will be encouraged to invest in low-carbon technologies and clean energy to promote the transformation and upgrading of the economic structure (Wang et al., 2023). In the research of Liu et al. (2022), they explore in depth the strategy of China's construction industry's transition to low-carbon development, emphasizing the importance of fully advancing the electrification of building energy consumption. This transformation not only improves the adaptability and flexibility of buildings in the change of energy structure, but also effectively reduces the dependence on high-carbon building materials through the precise control of the number of new buildings. In addition, the study noted that the use of low global warming potential (GWP) refrigerants has a significant effect on reducing refrigerant leakage during the construction operation phase. The development and application of carbon capture, utilization and storage (CCUS) technology is particularly critical to achieving long-term carbon reduction targets, which requires not only strong support from government policies and funds, but also public education and publicity on carbon reduction awareness (Wang et al, 2021). From a international perspective, despite the differences between the United States and China, the goal of carbon neutrality will be achieved more quickly if the two countries can coordinate and promote synergies in the development and implementation of carbon neutral technologies and policies. As the world's largest carbon emitters and economies, the two countries are crucial to achieving the goals of the Paris agreement (Dai et al, 2023).

Each article, while centered on China's shared ambition to achieve carbon peaking and neutrality, diverges in its assumptions and focal points of analysis. Although the significance of CCUS technology is acknowledged across most studies, Li (2023) hypothesize that China can achieve substantial progress towards its dual-carbon goals through advancements in global CCUS technology. In contrast, Liu et al. (2022) place a stronger emphasis on enhancing energy efficiency and promoting electrification within the construction sector, arguing that these measures can significantly reduce carbon emissions. The other two studies (Wang et al., 2021; Wei et al., 2022) highlight different aspects and pathways toward achieving carbon peaking and neutrality.

These appear to be discrepancies between some of the reported observations. Wei et al. (2022) do not provide a clear pathway for addressing these challenges in practice, illustrating a gap between theoretical considerations and their practical application. Meanwhile, Liu et al. (2022) appear to place excessive reliance on technological solutions, potentially overlooking the significant roles that social, economic, and cultural factors play in achieving carbon emission reductions. Li's research demonstrates an optimistic view of CCUS technology's potential, which may underestimate the economic and environmental challenges associated with its large-scale deployment. Furthermore, Wang et al. (2021) might have an overly optimistic perspective on the pace of technological innovation and the complexities of achieving international cooperation, suggesting an overestimation of current capabilities in confronting the real-world conditions necessary for carbon neutrality. In addition, the article emphasizes the importance and possibility of coordination and cooperation between the United States and China to achieve carbon neutrality goals, but the current political tensions between the two countries may affect the willingness and effectiveness of both sides to cooperate on climate change. Although the article proposes a series of coordination measures, it does not fully consider how this political factor concretely affects the cooperation process, especially in sensitive areas such as technology transfer and intellectual property protection (Dai et al., 2023)

However, the existing research has many problems. In exploring an analytical framework for a coordinated effort to achieve carbon neutrality between the United States and China, including shared policy milestones, technology exchanges, research and development priorities, and international leadership, we face several key challenges and limitations. First, the framework lacks specific implementation strategies and action plans, making it difficult to follow the assumed path in the actual process of social development. Especially in the context of the widening gap between rich and poor, the difficulty of achieving carbon neutrality in remote areas has increased significantly. In addition, large-scale pandemics such as COVID-19, and unpredictable factors such as war have also severely hindered the transition from carbon peak to carbon neutral. Although the United States and China have set a series of cooperation goals under the framework of carbon neutrality, the description of the concrete implementation of these frameworks and specific measures to promote cooperation between the two sides is still vague, and there is a lack of concrete proposals or models for operation. In addition, the differences and similarities between the two countries' domestic policies, potential points of conflict, and how to reconcile these differences at the international level to promote practical cooperation on achieving carbon neutrality goals are also issues that need to be further explored and resolved. In the impact of the Sino-US trade war and the job market, this paper analyzes how to affect the employment situation of the labor market through the impact on enterprises in different links of the supply chain.

2.3. Employment and the Labor Market

This part mainly analyzes the impact of the Sino-US trade war on labor market employment. In the analysis of employment in China's industrial enterprises, the core content of the report focuses on the impact of the escalation of Sino-US trade friction on China's job market in 2018, especially for the industrial sector. Chor and Li (2024) assessed the impact of the trade war on employment by matching the list of products subject to US tariffs to China's industrial classification of the national economy. The Sino-US trade friction mainly affects the manufacturing industry of textile and clothing, electronic communications and other equipment, with a potential impact of about 3.3 million people. Some studies analyze the influence of import and export advantages on enterprise employment from the perspective of upstream and downstream industries. In the case of exploring how import competition from the United States affects the employment of Chinese manufacturing enterprises, it is found that import competition from the United States significantly promotes the employment growth of Chinese manufacturing enterprises, which mainly plays a role through two channels: promoting enterprise innovation and increasing enterprise price mark-on. Although imports from the United States have no negative impact on overall employment in China, they can lead to a decline in employment in state-owned enterprises, as well as the flow of employment between different types of enterprises, suggesting that the government should attach great importance to this issue and take corresponding measures (Wei et al., 2020). In the impact of the Sino-US trade war and the job market, this paper analyzes how to affect the employment situation of the labor market through the impact on enterprises in different links of the supply chain (Tao et al., 2023).

Import competition in downstream industries may force domestic companies to enhance their competitiveness and respond to external pressures through technological innovation or optimization of production processes, which may contribute to job growth in the long run. Wei et al. (2020) research found that in the short term, import competition in downstream industries has a significant inhibitory effect on employment growth of Chinese manufacturing enterprises. The promotion effect of import competition in upstream industries on employment growth is greater than the inhibition effect of import competition in downstream industries. This means that import competition from the United States has generally contributed to job growth at Chinese manufacturing firms. The tariff increase caused by the trade dispute between China and the United States has led to a reduction in market demand for Chinese exporters, affecting direct-to-consumer companies further down the supply chain, such as retailers or manufacturers of final products. The increase in import tariffs has increased the cost burden of Chinese enterprises and reduced their market competitiveness, leading to a decrease in orders and a reduction in market share. This decline in market demand is then transmitted to upstream companies, which supply raw materials or primary processed products. Due to the decline in orders from downstream enterprises, upstream enterprises have to cut production, which may lead to layoffs or lower hiring levels to cope with the financial pressure brought about by the decline in demand. The study shows that the downstream contraction caused by the Sino-US trade dispute has affected employment in upstream companies, not only in companies directly involved in foreign trade, but also throughout the entire industrial chain through supply chain interdependence, especially for upstream companies that are highly dependent on orders from specific downstream companies. In addition, the impact of trade disputes is more significant for non-state-owned enterprises, multi-industry companies, companies with lower market concentration, less capital intensity, and fewer government subsidies (Tao et al., 2023)

While the studies provide important insights into the impact of the trade war, it does not provide a comparative analysis of possible positive outcomes in other industries or of companies' long-term adaptation strategies. The study mainly highlights the negative effects and may overlook areas where businesses may gain or the possibility of a positive shift in employment patterns because of the trade war (Wei et al., 2020).

Current research has not fully analyzed the heterogeneity of the impact of import competition on employment in various industries. In view of the significant differences in industry characteristics and their sensitivity to external shocks, future studies should dig deeper into industry-level data and reveal the mechanism of industry-specific import competition's impact on employment through more detailed analysis. Second, given the evolving trade frictions between China and the United States, the long-term and complex effects of policy changes on employment need to be further explored. In particular, how the policy adjustment affects the employment pattern by affecting the decision-making of enterprises, the adjustment of industrial structure and the adaptability of labor market, in this regard, future research should deepen the understanding of the employment dynamics under the background of policy changes. Finally, given that the study is largely based on historical data, its limitations in predicting future employment trends and making policy recommendations are obvious. In the face of rapid changes brought about by economic globalization and technological progress, future research needs to integrate more real-time data and adopt forward-looking analysis methods to enhance the timeliness of research results and the pertinence of policy recommendations. In this way, evidence-based guidance can be more accurately provided to policymakers, leading to more effective employment policy development and implementation (Tao et al., 2023). The research on the employment of industrial enterprises focuses on macro-analysis and policy suggestions and lacks details and operability for specific implementation. Secondly, the predicted potential employment impact is based on a series of assumptions and existing data, and the actual impact may vary due to changes in various internal and external factors, which may not fully reflect the impact of Sino-US trade frictions on China's overall employment market (Chor & Li, 2024).

3. METHODOLOGY

3.1. Research Design

This study will focus on applying quantitative research methodology to explore in depth the development of Sino-US trade relations and their implications for China's economy and the achievement of carbon neutrality goals. Through a comprehensive analysis of secondary data and selected case studies, this study aims to reveal the subtle dynamics and underlying logic of these complex relationships. In particular, the study will rely on an extensive literature review, review of historical data, and exhaustive analysis of representative business cases, with the aim of building a deep understanding of how China-U.S. trade and economic ties shape China's economic structure, influence environmental policy, and promote or hinder progress towards carbon neutrality. Through this approach, this study not only aims to fill the gaps in existing research, but also aims to provide empirical support and strategic guidance for relevant policy making, thereby contributing insights to sustainable development in China and the world.

3.2. Research Methodology

In this study, I used a combination of data sources to deeply analyze the impact of the US-China trade war on China's trade patterns, especially on the trends in sustainable product trade. I gathered data on China's imports and exports over the past 20 years from the World Bank's International Trade Statistics Database (WITS), GDP and per capita GDP information from the National Bureau of Statistics of China, and carbon emission data for China and globally from "Our World in Data." Through regression analysis, I precisely identified the key points of change in China's import and export structure triggered by the trade war, exploring the effects of factors like tariff changes. Following this, by applying the Environmental Kuznets Curve (EKC) hypothesis, my research examines the relationship between economic growth and environmental pollution, particularly analyzing whether a reduction in carbon emissions can be achieved after reaching a certain level of economic development. Moreover, through multiple regression analysis, I assessed how economic growth, changes in trade policy, and environmental factors together impact the job market, especially against the backdrop of the US-China trade war.

4. RESULTS

4.1. Background of Foreign Direct Investment from China to U.S.

Through its ability to facilitate cross-border flows of cash, technology, and experience, foreign direct investment (FDI) is a key driver of economic integration. The biggest economies of the world exchange large amounts of investment, especially China and the US are not only large in scale, but also have far-reaching implications for the shaping of the global economic landscape. In this chapter, the complex relationship between China's FDI to the United States and China's own GDP growth is explored in depth. As two of the world's most important economies, investment flows between China and the United States are not only substantial, but also profoundly affect the economic strategies and growth trajectories of both sides.

In contrast to the centuries of global business experience accumulated by firms and capitals in developed Western countries, the large-scale "going out" strategy of Chinese firms and capitals did not actually begin until the new century. Against this backdrop, the bilateral investment relationship only began to receive more attention in the new century, despite the fact that trade relations between China and the United States have continued to grow significantly in the 40 years since the establishment of diplomatic relations.

From Figure 1, China’s direct investment in the United States climbed slowly at the beginning of the twenty-first century, and then increased rapidly after 2011, reaching an all-time high in 2019. However, this growth momentum suffered a major setback after 2019 due to the intensification of the U.S.-China trade war and the global outbreak of the New Crown epidemic. Following the start of the US-China trade war in 2018, the US government imposed tariffs on tens of billions of dollars of Chinese imports in response to its dissatisfaction with China's trade policies and intellectual property practices (Gong, 2020). China responded with tariffs on a similar scale. The trade war has not only affected merchandise trade between the two countries, but also heightened uncertainty in the investment arena, severely impacting Chinese companies' investment decisions and operations in the United States. As the dialogue between the two sides advances and the situation evolves, investment flows show volatility, and the friction between the world's two largest economies reflects the complexity of international trade and investment in the context of globalization.

4.1.1. Data Description

This study used base-10 logarithmic transformations on the raw data to decrease heteroscedasticity and meet the constraints of the linear regression model, given the wide range of economic variables included. In particular, the logarithmic equivalents of the total GDP (log_gdp), per capita GDP (log_per_capita_gdp), total export and import values (log_export, log_import), and export and import price indices (log_export_price_index, log_import_price_index) were created using the "Compute Variable" function in the SPSS software. The regression analysis that followed made use of these recently generated log variables. After the pre-processing of the data was completed, this study constructed a linear regression model by setting the log-transformed total GDP as the dependent variable and the logarithmic form of GDP per capita, the amount of imports and exports, and the logarithm of the import and export commodity price indexes as the independent variables, and by doing so, the intention was to investigate the relationship between these economic indicators and GDP. The model assumptions in this work, including normality, linearity, independence, and isotropy of the data, were examined before formalizing the regression analysis. The remaining diagnostic plots in SPSS were used as a visual check to make sure the regression model's assumptions were met.

4.1.2. Results Interpretation

Table 1. Model Summary of GDP

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.993[a]	.987	.981	.05392	.987	194.922	6	16	<.001

a. Predictors: (Constant), log_fdi_us_to_china, log_import_price_index, log_export_price_index, log_fdi_china_to_us, log_import, log_export

Source: Processed by Author through SPSS, 2024.

In a regression model, the adjusted R-squared value is a measure of the variance of the dependent variable explained by the independent variables. In this case, the adjusted R-squared value of .987 means that 98.7% of the variance of China's log-transformed GDP may be accounted for by the model's independent variables. There is a very strong linear association between the predictor factors and the outcomes, as seen by this exceptionally high number. The number of predictor variables in the model is taken into consideration by the modified R-squared value meaning that it is able to account for the fact that the R-squared value may be artificially inflated when more variables are added. Therefore, this high value indicates that the model fits the data very well, providing a reliable understanding of how the independent variables are associated with GDP growth in China.

Table 2. ANOVA of GDP

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.400	6	.567	194.922	<.001[b]
	Residual	.047	16	.003		
	Total	3.447	22			

a. Dependent Variable: log_gdp

b. Predictors: (Constant), log_fdi_us_to_china, log_import_price_index, log_export_price_index, log_fdi_china_to_us, log_import, log_export

Source: Processed by Author through SPSS, 2024.

Table 3. Correlations of GDP

Correlations

		log_gdp	log_export	log_import	log_export_price_index	log_import_price_index	log_fdi_china_to_us	log_fdi_us_to_china
Pearson Correlation	log_gdp	1.000	.966	.962	.181	-.176	.961	.976
	log_export	.966	1.000	.997	.272	-.104	.885	.965
	log_import	.962	.997	1.000	.281	-.085	.881	.957
	log_export_price_index	.181	.272	.281	1.000	.787	.083	.170
	log_import_price_index	-.176	-.104	-.085	.787	1.000	-.193	-.162
	log_fdi_china_to_us	.961	.885	.881	.083	-.193	1.000	.943
	log_fdi_us_to_china	.976	.965	.957	.170	-.162	.943	1.000
Sig. (1-tailed)	log_gdp	.	<.001	<.001	.204	.211	<.001	<.001
	log_export	.000	.	.000	.104	.319	.000	.000
	log_import	.000	.000	.	.097	.350	.000	.000
	log_export_price_index	.204	.104	.097	.	.000	.353	.219
	log_import_price_index	.211	.319	.350	.000	.	.189	.230
	log_fdi_china_to_us	.000	.000	.000	.353	.189	.	.000
	log_fdi_us_to_china	.000	.000	.000	.219	.230	.000	.
N	log_gdp	23	23	23	23	23	23	23
	log_export	23	23	23	23	23	23	23
	log_import	23	23	23	23	23	23	23
	log_export_price_index	23	23	23	23	23	23	23
	log_import_price_index	23	23	23	23	23	23	23
	log_fdi_china_to_us	23	23	23	23	23	23	23
	log_fdi_us_to_china	23	23	23	23	23	23	23

Source: Processed by Author through SPSS, 2024.

Table 4. Coefficients of GDP

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	Upper Bound	Correlations Zero-order	Partial	Part
1	(Constant)	2.281	1.580		1.444	.168	-1.068	5.630			
	log_export	.401	.598	.357	.672	.511	-.865	1.668	.966	.166	.020
	log_import	.125	.546	.105	.229	.822	-1.033	1.283	.962	.057	.007
	log_export_price_index	1.710	1.401	.078	1.220	.240	-1.261	4.680	.181	.292	.035
	log_import_price_index	-1.045	.693	-.091	-1.508	.151	-2.514	.424	-.176	-.353	-.044
	log_fdi_china_to_us	.238	.047	.488	5.079	<.001	.139	.338	.961	.786	.148
	log_fdi_us_to_china	.045	.190	.043	.237	.816	-.359	.449	.976	.059	.007

a. Dependent Variable: log_gdp

Source: Processed by Author through SPSS, 2024.

From Table 2, the ANOVA table's value of change in F determines if the variance explained by the model is substantially larger than the variance that remains unexplained. the p-value of less than 0.01 indicates that the chance of the explanatory power of the regression model is less than 0.1 per cent, which suggests that the set of independent variables has a very significant predictive power for the dependent variable.

Based on Table 3 and Table 4, The study found an unstandardized regression coefficient of 2.238 for China's direct investment in the U.S., with a standard error of 0.047. This unstandardized coefficient points to the fact that for every unit increase in China's direct investment in the U.S., the corresponding increase in China's log-transformed GDP is expected to be 2.238 units. The significance level of this coefficient ($p < .001$) indicates that the observed effect is statistically significant, thus virtually ruling out the possibility that random variation contributed to this result. The standardized coefficient (Beta) of .488 implies that China's direct investment in the United States plays a stronger role in explaining the changes in China's GDP compared to the other independent variables in the model. The high value of this Beta indicates that China's direct investment in the United States has a greater influence on China's GDP among all the independent variables studied. This influence is second only to the relationship between GDP and exports in the model, which has a Pearson correlation coefficient of 0.966, indicating that exports also have a significant impact on GDP.

This coefficient's 95% confidence interval, which spans 0.139 to 0.338, supports the notion that China's GDP growth and its investment in the US are positively correlated. Put otherwise, at the 95% confidence level, there is a good chance that the genuine regression coefficient value falls within this range. After adjusting for the other independent variables, the substantial independent correlation between China's GDP and its direct investment in the US is still present, as seen by the partial correlation coefficient of.786, which indicates this. Once the impacts of additional variables are considered, the partial correlation coefficient shows the degree of relationship between a particular predictor variable and the result variable.

The correlation matrix further shows that the Pearson correlation coefficient between China's direct investment in the United States and China's GDP is 0.961, and this very high correlation significantly confirms the existence of a significant positive correlation between the two. This strong correlation is not only statistically significant ($p < .001$), but it is also consistent with economic theory, which asserts that FDI can contribute to economic growth through technology transfer, managerial skills upgrading, and deeper global market integration, suggesting that China's FDI in the U.S. may be contributing to the country's economic development through a variety of mechanisms.

In this regression analysis, the results of the model clearly indicate that China's direct investment in the United States is the variable that has a significant impact on China's economic growth. This indicates that as China's investment in the United States increases, its domestic GDP shows a corresponding growth trend. Therefore, when formulating international investment strategies and macroeconomic policies, China's direct investment in the United States should not be ignored, but instead should be seen as a key factor in driving China's sustained economic growth. In the context of interactive investment by the world's two most important economies, this finding brings a new perspective on the positive economic effects of China's outward investment. The significance of this relationship is not only statistically confirmed, but its substantial implications also provide solid support for the strategic layout that China has adopted in its economic globalization. Outward investment as a way of exporting capital is more helpful for China to expand its international market and acquire more resources in the international market. These results strongly suggest that China's direct investment in the United States should be incorporated into the country's macroeconomic decision-making and international investment strategy. Overseas investment activities are important for foreign economic interactions in an economically globalized world, and they also have significant effects on the domestic economy. As economic globalization increases, the economics and laws governing foreign direct investment continue to grow more intricate.

4.1.3. Economic Implications

China's injection of FDI into the U.S. has fostered considerable economic growth and technological progress, an economy that not only fosters industrial upgrading but also contributes quite significantly to U.S. GDP growth. Chinese FDI's advanced technology and capital inflows have raised the productivity and competitiveness of American sectors, which has had an advantageous knock-on effect on the economy (Sarkodie & Strezov, 2018). The connection between foreign direct investment and economic advantages is nuanced. FDI has the potential to boost the economy, but if it is not controlled, it may have unfavorable effects on the environment (Hepburn et al., 2021). Achieving a balance between environmental sustainability and economic growth is crucial for China's sustainable development and carbon neutrality.

FDI can drive economic growth by promoting industrialisation and technological upgrading in recipient countries through capital inflows and technology transfer. However, such growth is often accompanied by increased energy consumption and carbon emissions. Particularly in highly polluting and energy-intensive industries, unfiltered FDI inflows may lead to a lowering of environmental standards in order to attract more FDI, which is particularly common in developing countries. But the environmental impact of FDI is not static and is closely linked to the quality of the host country's institutions and policy preferences. In countries with stricter environmental regulations and stronger enforcement, FDI is more likely to bring environmentally friendly technologies and management practices that promote environmental protection and resource efficiency (Hepburn et al., 2021). Under these circumstances, FDI contributes to a "pollution halo" effect, a relative reduction in carbon emissions through technology transfer and environmental improvements (Duan & Jiang, 2021; Abbasi et al., 2023).

When Chinese companies invest in the U.S. in the high-tech and clean energy sectors, these actions are not only business expansion, but also an important way to gain access to technology and knowledge (Chia, 2022). By investing in solar energy projects in California, China Financial Group has been directly exposed to the latest developments in solar energy technology in the United States. The U.S. has advanced experience in the research, development and commercialization of solar energy technology, particularly in the areas of efficiency improvements, cost reductions and integration of smart grid technology in solar panels. Through these projects, Chinese companies not only gain access to the technologies themselves, but also learn how to deploy and optimize them in different market environments. Once the imported technologies and experiences are returned to China, companies make local adjustments and optimizations to make them more suitable for the domestic market and environmental conditions. For example, solar technologies may be configured and optimized differently in western and eastern China to suit the intensity of sunlight and usage needs of different regions. This process involves not only technology adaptation, but also localization of the supply chain, adaptive improvements in product design, and collaboration with local governments and power companies. The Chinese government's carbon-neutral goals provide policy support and market demand for such technology transfer. Various government subsidy policies, tax incentives, and financial support for new energy projects have greatly facilitated the adoption and diffusion of clean energy technologies such as solar. The market operation experience and policy response strategies that companies learn in the U.S. help them to more effectively promote new technologies and expand their business in the Chinese market. Successful cases of Chinese companies at home and abroad demonstrate the commercial viability and environmental benefits of solar technologies, which has a demonstration effect on other companies and encourages more domestic and foreign investment flows into the clean energy sector. In addition, the successful implementation of these projects can increase public awareness and acceptance of the benefits of renewable energy, thereby promoting support for and participation in carbon reduction targets throughout society. Through such investments, China not only promotes the development of clean energy technologies domestically, but also demonstrates its contribution and leadership on global environmental protection and climate change issues internationally. This has helped to enhance China's reputation in the international community, promote international co-operation projects, and participate more actively in the administration of the global climate.

In the globalized economy, China has successfully introduced and localized a number of advanced clean technologies through direct investment in the US, despite the tensions of the trade war between China and the US. This cross-border technology transfer and cooperation, particularly in the areas of wind power and electric vehicles, has not only accelerated the proficiency of Chinese companies in these key technologies, but has also promoted the widespread application and industrialization of these technologies at home. For example, the co-operation between Chinese enterprises and US electric vehicle manufacturers developed a series of new technologies, which were later rapidly promoted in China's electric vehicle industry, significantly enhancing the market competitiveness and technical level of related products.

While the trade war has posed many challenges, such as higher tariffs and market access restrictions, it has also prompted China to accelerate the pace of technological innovation and independent R&D. Under this pressure, China's green technology industry has developed rapidly, thereby reducing its dependence on external high-tech and key components. In addition, through the introduction and localization of these technologies, China has not only strengthened the global competitiveness of its domestic industries, but also accelerated its go from a manufacturing power to a strength in manufacturing.

These technology transfer and co-operation programmed have had a profound impact on China's sustainable development. First, this process has directly enhanced China's energy security, reduced its dependence on external energy sources, and effectively reduced environmental pollution. The application of these environmentally friendly technologies, especially the advances in the field of renewable energy, directly responds to the country's strategic need for green and low-carbon development. Secondly, the indirect impact is reflected in the promotion of global green technology innovation while opening the door to the international market for Chinese green technology enterprises.

Although the US-China trade war has brought pressure and challenges to the bilateral relationship, it has also stimulated China's self-innovation and international co-operation in green technology and environmental protection industries. Through these strategic international co-operation and self-imposed pressure, China has not only ensured national energy security and environmental sustainability, but also contributed China's strength to the global climate action, showing its active participation and responsibility in global environmental governance.

4.2. Carbon Emissions and Economy Growth

Energy is a major requirement for human growth. The demand for energy has increased due to the pace of global economic expansion and the ongoing industrialization of many nations. Additionally, in the early phases of industrialization, environmental concerns were frequently neglected in favor of economic expansion at a quick pace, which resulted in the current catastrophic global greenhouse effect and energy scarcity (Osuntuyi et al., 2022). A unifying threat to the sustainable economic and social growth that all nations face is global climate change. As a significant nation, China has demonstrated its commitment to addressing climate change by joining the Paris Agreement and submitting the "Intended Nationally Determined Contributions" plan. The Chinese government has placed a high priority on this issue. Since the 1990s, nations all over the world have become more aware of climate-related challenges, realizing the importance of energy for economic growth and transitioning to a low-carbon economic model. This strategy seeks to minimize environmental damage, maximize the use of energy resources, and promote economic growth. China's industrialization and urbanization have intensified because of its reform and opening up, which has resulted in a sharp rise in energy consumption and ongoing increases in carbon emissions. The notion of green development was first presented in the "13th Five-Year Plan" (Gosens et al., 2017). China wants to reduce carbon emissions overall by making manufacturing and lifestyle more eco-friendly and low-carbon, all the while sustaining a medium-to-high pace of economic development.

According to the Environmental Kuznets Curve (EKC) theory, there is an inverse U-shaped link between economic growth and environmental deterioration. Environmental deterioration often rises as an economy expands from low to middle income; the pattern reverses and environmental quality improves as the economy advances to a higher income level. Better environmental laws, technical developments, and the movement in society from manufacturing to service sectors are all recognized as contributing factors to this change (Stern, 2014). In the context of China, the rapid economic growth over recent decades has been paralleled by a significant increase in energy consumption and carbon emissions, reflecting the early upward trajectory of the EKC. However, current policies and strategic plans indicate China's commitment to transitioning towards the downward slope of the EKC. This involves enhancing energy efficiency, investing in renewable energy, and implementing stringent environmental regulations. Such efforts are aimed at decoupling economic growth from carbon emissions, ultimately steering the nation towards a sustainable and environmentally conscious development path.

4.2.1. Data Description

The research methodology of this chapter is based on the Environmental Kuznets Curve (EKC) theoretical framework, which aims to explore the relationship between economic growth and carbon emissions. For this purpose, annual carbon emissions data for China from 2000 to 2022 were collected at the World Resources Institute, and Researchers acquired GDP figures for the relevant time frame from China's National Bureau of Statistics. These authoritative sources of data ensure the authenticity and validity of the analysis.

This study uses an ordinary logarithmic transformation to improve the distributional properties of squared GDP per capita and total carbon emissions, given the skewed distribution of the raw data. This ensures that the data are closer to a normal distribution, thereby lowering the risk of model heteroskedasticity. In addition to assisting to increase the accuracy and explanatory capacity of the model's predictions, this transformation is necessary to meet the fundamental assumptions of the linear model.

Exhaustive descriptive statistical analyses were carried out using SPSS software, and key statistical indicators such as standard deviation, and number of observations of the variables were calculated, laying the foundation for further correlation and regression analyze. By calculating the Pearson's correlation coefficient, this study quantified the linear correlation between the two log-transformed variables and found a significant positive correlation between them.

In the constructed linear regression model, GDP per capita squared in logarithmic form is used as the independent variable, and total carbon emissions in logarithmic form is used as the dependent variable. The modelling takes into account the EKC theory's presuppositions about the relationship between economic growth and environmental impacts, which in turn assesses the long-term trend relationship between economic size and carbon emissions.

During the diagnostic process of the model, rigorous tests for pairwise linear relationships, multicollinearity, heteroskedasticity, and independence were conducted to ensure that the statistical assumptions of the regression model were met. The results of the model diagnostics support the rationale for using a linear regression model, and the estimation of the model parameters shows a strong relationship between GDP per capita squared and carbon emissions.

4.2.2. Results Interpretation

Table 5. Descriptive Statistics of EKC

Descriptive Statistics

	Mean	Std. Deviation	N
log_carbon_emission_total	9.8882	.16086	23
log_gdp__per_capita_squared	13.2833	2.69143	23

Source: Processed by Author through SPSS, 2024.

In this study, two key indicators were analysed: the natural logarithm of total carbon emissions (log_carbon_emission_total) and the natural logarithm of GDP per capita squared (log_gdp_per_capita_squared). The sample size for this study is 23 years. The average natural logarithm value of total carbon emissions is 9.8882, indicating that total carbon emissions are relatively high on the logarithmic scale. Correspondingly, the average logarithmic value of GDP per capita squared is 13.2833 which pointed a higher level of economic development in the sample data. The standard deviations of the two variables are 1.6086 and 2.69143, indicating that the data points in the sample exhibit a moderate level of variability.

Table 6. Correlations of EKC

Correlations

		log_carbon_emission_total	log_gdp__per_capita_squared
Pearson Correlation	log_carbon_emission_total	1.000	.971
	log_gdp__per_capita_squared	.971	1.000
Sig. (1-tailed)	log_carbon_emission_total	.	<.001
	log_gdp__per_capita_squared	.000	.
N	log_carbon_emission_total	23	23
	log_gdp__per_capita_squared	23	23

Source: Processed by Author through SPSS, 2024.

The regression analysis calculated the Pearson's correlation coefficient between the two variables with a value of 0.971, which shows a very strong positive correlation implying that as the GDP per capita squared increases, the total carbon emissions also increase significantly. The statistical significance test for the correlation ($p < 0.001$) was well below the commonly used significance level of 0.05, making this finding highly statistically confident.

Table 7. Model Summary of EKC

Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.971[a]	.943	.940	.03948	.943	344.230	1	21	<.001

a. Predictors: (Constant), log_gdp__per_capita_squared

Source: Processed by Author through SPSS, 2024.

The regression analysis showes a very good model fit with a correlation coefficient (R) of 0.971, indicating that the model was able to explain 97.1 per cent of the variation in the dependent variable. The model's R-squared value was 0.943, and its adjusted R-squared value was 0.940, indicating that the independent variables account for the great majority of the variance seen in the dependent variable. With a p-value of less than 0.001, the model's F-statistic of 344.230 indicates that it has a highly statistically significant predictive capacity.

Table 8. ANOVA of EKC

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.537	1	.537	344.230	<.001[b]
	Residual	.033	21	.002		
	Total	.569	22			

a. Dependent Variable: log_carbon_emission_total

b. Predictors: (Constant), log_gdp__per_capita_squared

Source: Processed by Author through SPSS, 2024.

The ANOVA results in Table 8 shows that the regression model significantly fit the data (F = 344.230, p < 0.001), indicating that at least one of the predictor variables explained the variability in the dependent variable in a statistically significant way. The regression sum of squares was 0.537, which accounted for most of the total variance, while the residual sum of squares was 0.033, indicating that there was very little unexplained variance in the model.

Table 9. Coefficients of EKC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.117	.042		215.287	<.001
	log_gdp__per_capita_squared	.058	.003	.971	18.553	<.001

a. Dependent Variable: log_carbon_emission_total

Source: Processed by Author through SPSS, 2024.

The coefficients indicate that each unit increase in the logarithm of the squared GDP per capita will result in a 0.058 unit increase in the logarithm of total carbon emissions, controlling for other variables. The estimate of the constant term is 9.117, indicating the logarithmic value of the predicted carbon emissions in the absence of economic development (i.e., zero per capita GDP squared). The standardized coefficient Beta of the independent variables in this model is 0.971, again demonstrating the strong positive correlation between GDP per capita and carbon emissions.

By analyzing China's GDP per capita squared and total annual carbon emissions, a strong positive correlation is observed, which not only confirms the validity of the regression model, but also matches the predictions of the Environmental Kuznets Curve (EKC) theory. This strong positive correlation reveals a reality that cannot be ignored: as GDP grows, carbon emissions also increase, reflecting China's environmental situation in the early stages of economic development. In addition, this study further supports the key assumption of the EKC theory that there is a direct positive correlation between economic growth and environmental pollution at a certain stage of economic development.

China's economy continues to expand and this might lead to more environmental problems. China is dedicated to lowering environmental pollution while sustaining economic growth, and it has placed carbon neutrality objectives on the agenda in response to the rising global concern about carbon emissions. The Chinese government can create more effective environmental policies thanks to these initiatives, which are especially significant for policy creation because they give the government a strong foundation on which to build policies that promote both economic development and long-term environmental sustainability.

4.2.3. Low Carbon Development in Industry

The industry is significantly characterized by high energy consumption and emissions is a major source of greenhouse gases. This is due to the rapid growth in industrial carbon emissions as China's industrialization accelerates, especially the rapid growth in the output value of heavy industries such as the petroleum and the construction materials and non-metallic mineral products sector, the chemical industry, the production of machinery and equipment, and the metal processing industry. The Chinese government has integrated the response to climate change into the overall situation of social and economic development, and taken such important measures as controlling the total amount and intensity of energy consumption, enhancing energy efficiency, modifying the industrial structure, and improving the energy structure developing the recycling economy, developing non-fossil energy sources, accelerating technological innovation in emission reduction, improving the carbon emission trading mechanism, and strictly enforcing the law on the environment so that the reduction of carbon emission from industry has achieved remarkable results and reversed the situation of high growth of carbon emission from industry in the past (Lei et al, 2023). The situation of high growth in industrial carbon emissions has been reversed. However, as China is the world's largest carbon emitter, industrial carbon emissions are still in the stage of fluctuating on a high platform in terms of annual changes. For China, the key to reaching industrial carbon peaks lies in compressing the high plateau period and accelerating towards zero emissions.

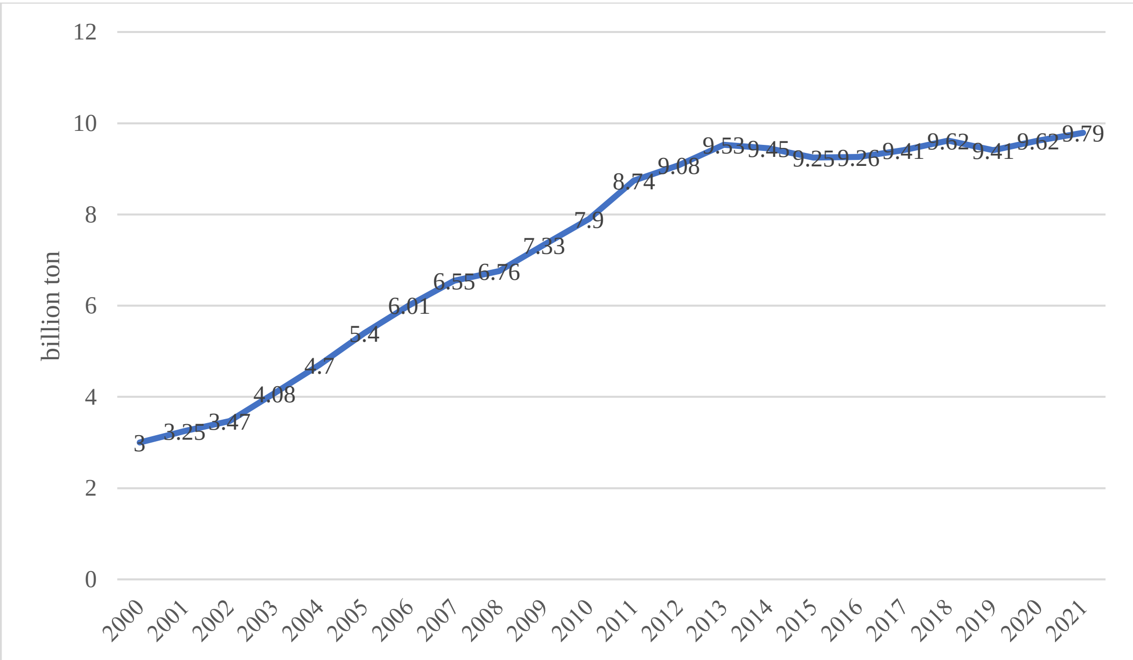

Figure 3. Carbon emissions from industry sector

Source: Carbon Emission Accounts and Datasets, 2024.

From Figure 3, 300 million tonnes of CO2 in 2000 to 1,036 million tonnes of CO2 in 2021, China's industrial carbon emissions show a significant growth trend. In particular, carbon emissions grew most rapidly between 2003 and 2010, when the average annual growth rate reached a relatively high level. While the overall trend is still upwards, the rate of growth in carbon emissions slowed between 2013 and 2021. In particular, carbon emissions declined slightly between 2014 and 2016, reflecting some industrial restructuring and the effects of policy. The direct impact of the trade war in the post-2018 period is observable in the carbon emissions data from 2018 to 2019.China's carbon emissions of 962 million tonnes of CO2 in 2018 increase slightly to 979 million tonnes of CO2 in 2019, suggesting that China's overall industrial activity has continued to grow despite external trade pressures. The 2020 data is complicated by the COVID- 19 outbreak complications, with carbon emissions reaching 988 million tonnes of CO2, before rising to 1,036 million tonnes of CO2 in 2021 as the economy recovers rapidly.

China experienced rapid industrialisation, with the development of sectors such as iron and steel, chemicals and building materials in particular contributing significantly to the growth of carbon emissions. However, following the outbreak of the trade war between the United States and China, major export-oriented industrial sectors, such as steel, electronics and machinery manufacturing, suffered a reduction in export orders, leading to a slowdown in production activities (Chou et al., 2021). This change led to a corresponding reduction in energy demand and carbon emissions. Nonetheless, the impact has been complex and non-linear, with some industries increasing production to meet domestic market demand, which may lead to a localised rise in carbon emissions in the short term (Gao et al, 2021).

Figure 4. Green and low-carbon industrial development

Source: China Academy of Telecommunication Research of MIT, 2024.

Under the current dual-carbon agenda, the expression ‘green and low-carbon development' was very much in line with the context of the new stage of development. In the Figure 4, green and low-carbon development of industry emphasizes a new path of industrialization with low consumption of resources and energy, low environmental pollution and carbon emissions, high technological content and good economic efficiency. Its characteristics included low consumption, low energy consumption, low emissions, high efficiency and high profitability, and the achievement of coordinated development of the economy and the environment.

This development model is an inevitable choice for the economy and society to reach a certain stage of development, with the core of breaking through the limitations of the carrying capacity of resources and the environment and seeking the harmonious unity of economic growth and resources and the environment to achieve a win-win situation for development and the environment, and a harmonious symbiosis between human beings and nature. Green development, circular development and low-carbon development complement each other, promote each other, and together constitute an organic whole. Among them, green is a comprehensive requirement for development and the main line of transformation, circular is an effective way to improve resource efficiency, and low-carbon is an important part of the orderly adjustment of the energy strategy system.

Against the backdrop of large-scale development of the industrial economy, it has become inevitable to consume large quantities of energy resources and emit pollutants on a large scale, which constitutes the ‘golden triangle’ of industrial development. In order to reduce the impact on the environment, it is necessary to reduce the use of energy resources, adjust and optimize the energy structure and industrial structure, in order to improve efficiency and increase the effectiveness of these three constitute the ‘Green Triangle’.

According to Figure 4, the combination of the ‘Golden Triangle’ and the ‘Green Triangle’ graphically depicts the inherent logical relationship of industrial green and low-carbon development. The ultimate goal of industrial green and low-carbon development is to build a new type of industrialisation and modernisation with Chinese characteristics, to form new productive forces, to achieve the goals of carbon peaking and carbon neutrality, and to achieve harmonious coexistence between human beings and nature.

In this transition process, the trade war between China and the United States may have a certain impact on industrial green and low-carbon development. The trade war may lead to a rise in the cost of importing key technologies and materials, thus affecting the adoption and popularisation of energy-saving and emission reduction technologies. It may also hinder the expansion of domestic firms' foreign markets, which in turn may affect their ability to invest in green technologies. However, it may also prompt China to accelerate technological innovation and enhance the autonomy and control of the industrial chain, thereby promoting the development and application of green and low-carbon technologies to a certain extent.

4.2.4. Low Carbon Development in Agriculture

Agricultural carbon emissions include greenhouse gases emitted during the production of agricultural land and during changes in the use of agricultural land. Among the sources of carbon emissions, enteric fermentation of livestock such as cattle and sheep, fertilizer application during agricultural cultivation, rice cultivation and energy use during agricultural production are the main sources of agricultural carbon emissions in China, accounting for 3/4 of the total agricultural carbon emissions in China, and they are the main targets of concern for carbon emission reduction (Song et al, 2023). Carbon neutrality in agriculture is not the pursuit of zero carbon emissions from agricultural production, nor is it the suppression of carbon emissions at the expense of agricultural output and food production; rather, it is the reduction or offsetting of greenhouse gas emissions from agriculture through technological innovation, improved production management and other means, taking into account the substantial increase in per capita food consumption demand in the future, as well as the sustained transformation of the dietary structure, to achieve net-zero emissions from agricultural production.

From 2000 to 2006, carbon emissions from China's agriculture, forestry, livestock and fisheries sectors soared rapidly in Figure 5, possibly reflecting the intensification of industrial activity that traditionally accompanies economic growth. The temporary mitigation trend that occurred between 2006 and 2008 may indicate an initial response to emerging environmental issues and the implementation of early mitigation policies. However, until 2017, the linear increase in emissions marked a period of sustained growth and industrial expansion, which may have masked environmental initiatives.

Strategic revision of both local and international economic activity has been triggered by the trade war between the United States and China. including in the sectors mentioned above. reductions in emissions after 2017 may be consistent with a broader economic slowdown and industry restructuring to adapt to more sustainable practices in response to the trade challenge. A continued flat trend to 2021 suggests stabilization in these sectors in the face of continued trade uncertainty and may also reflect China's strengthened environmental policies, its commitment to the Paris Agreement and its drive towards carbon neutrality.

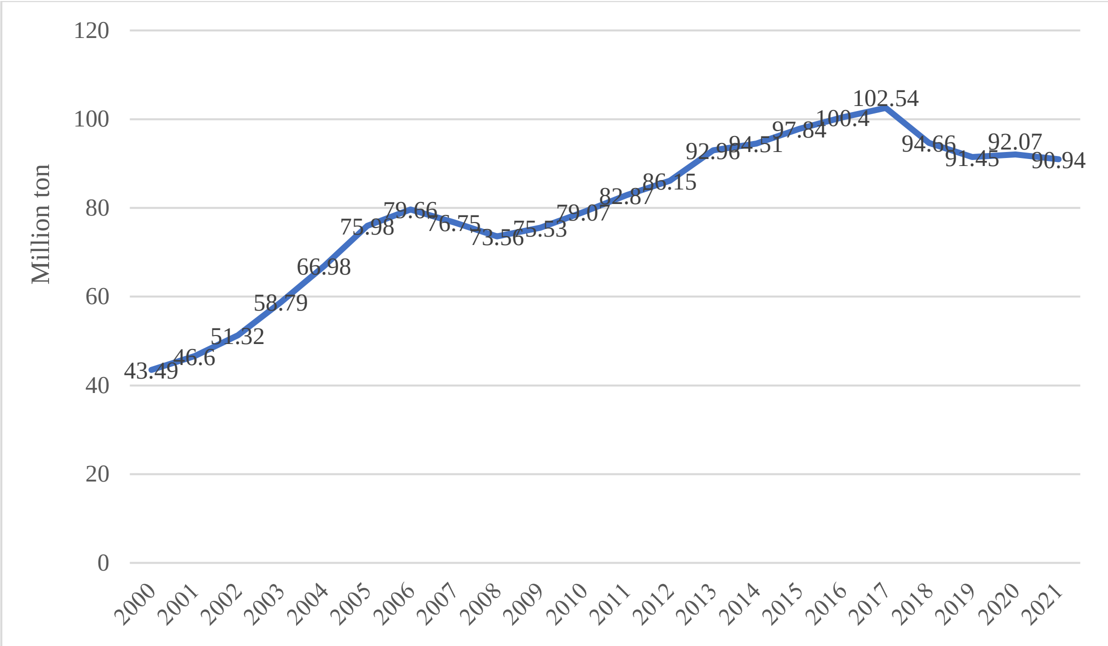

Figure 5. Carbon emissions from agriculture, forestry, animal husbandry, fishing and water conservancy

Source: Carbon Emission Accounts and Datasets, 2024.

Compared with developed countries, China faces enormous challenges in achieving carbon neutrality in agriculture. Currently, Chinese agriculture is at a critical stage of transition to modernized agriculture, a process that is characterized by high uncertainty and relatively limited space for choice. In addition, China's practice of agricultural emission reduction and carbon sequestration technologies started late, and the research and development of and support for low-carbon technologies are still insufficient. As the domestic demographic structure and national dietary structure continue to change, the process of promoting carbon neutrality in agriculture needs to simultaneously consider a number of strategic objectives such as food security, rural revitalization. In this context, the uncertainties surrounding the Sino-US trade war have further impacted Chinese agriculture. The trade war may raise the price of essential agricultural inputs and have an impact on Chinese agricultural export markets, which would be unpredictable for farmers' earnings and output. Chinese agriculture must adapt to changes and challenges in the global trade environment while achieving carbon neutrality goals due to these external forces.

It is crucial to promote the innovation and application of low-carbon technologies in agriculture. To this end, it is recommended that an agricultural low-carbon technology assessment group be set up to focus on scientifically formulating and evaluating the cost-effectiveness of emission reduction technologies, as well as promoting climate-smart and low-carbon eco-friendly technologies. Enhancing the motivation of agricultural extension workers and the demonstration role of agricultural stations will help increase the acceptance and adoption of low-carbon technologies by farmers.

In terms of funding and systems, the government should increase financial support for agricultural low-carbon projects and set up special funds for research and development of carbon emission reduction technologies and carbon trading mechanisms. In addition, it should actively develop agricultural low-carbon compensation systems and carbon markets, using market mechanisms to encourage emissions reduction behaviour, while supporting carbon emissions reduction in agriculture through tax and subsidy policies.

Trade policy also has an important impact on the success of agricultural carbon neutrality. Against the backdrop of the US-China trade war, Chinese agriculture will need to cope with rising costs of inputs and volatility in export markets, which are not insignificant challenges. Policymakers need to take these external factors into account and develop resilient strategies to adapt to changes in the international trade environment, to ensure stability in the supply and prices of agricultural products, and to prevent trade volatility from unduly affecting the process of agricultural carbon neutrality. The development and implementation of such strategies will ensure that agriculture is able to respond effectively to uncertainties in international markets while pursuing low-carbon goals.

4.2.5. Low Carbon Development in Transportation

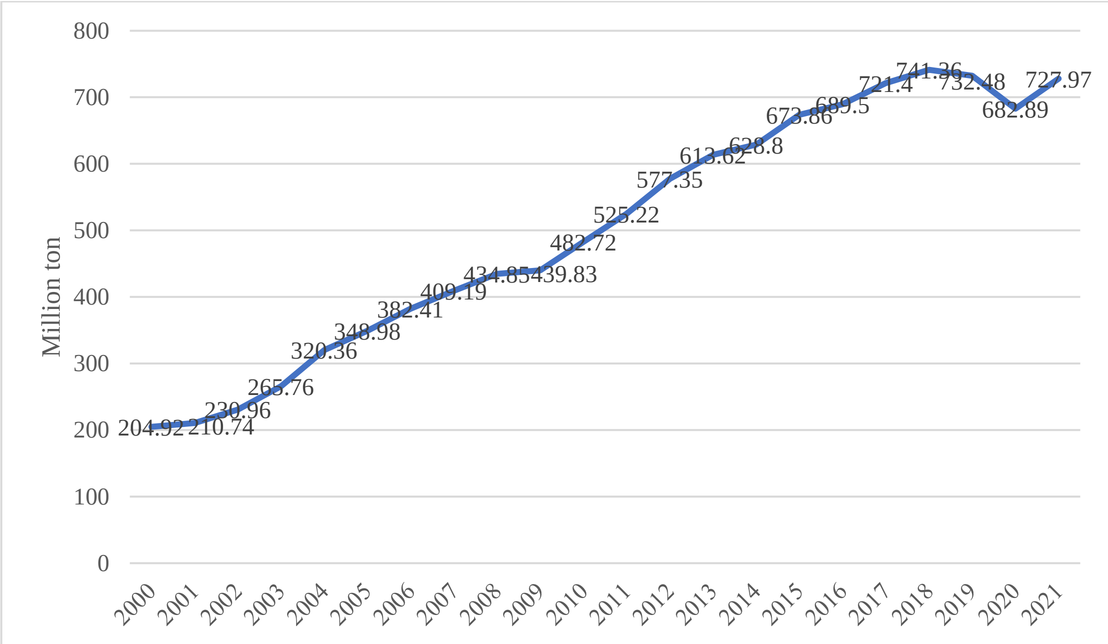

Figure 6. Carbon emissions from Transportation, Storage, Post and Telecommunication Services

Source: Carbon Emission Accounts and Datasets, 2024.

At present, the transport sector is the second largest source of carbon emissions globally, especially in China, where carbon emissions from this sector are growing rapidly. Combating climate change and for the industry, attaining low-carbon development has become a pressing concern. Particularly in the important infrastructure of ports, although the proportion of direct carbon emissions is not high, the potential for emission reduction is huge due to its importance as a cargo hub. From the data in the Figure 6, the development of green ports can be divided into three stages: Stage 1.0 focuses on direct emissions within the port, using mature technologies to control emissions; Stage 2.0 expands to full-caliber emissions, integrating green development inside and outside the port in a more comprehensive way; and Stage 3.0 focuses on emissions from a whole-chain perspective, comprehensively upgrading the green and low-carbon level of the logistics chain from the perspective of life-cycle management (Chen et al, 2019).

The low-carbon transformation of China's transport industry is important for both internal environmental protection and sustainable growth, as well as responding to international trade dynamics, in light of the ongoing trade war between the US and China. As environmental standards get more attention worldwide, the US has been strengthening environmental criteria for imported goods, which has forced Chinese enterprises to raise their own environmental standards in order to compete with outside threats. China has taken an aggressive approach to developing electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs), particularly in the field of new energy vehicles. This is not only helping to reduce carbon emissions domestically but is also creating a new window of opportunity for Chinese brands to compete in the global market. The launch of the American Tesla brand in China has accelerated the growth of the country's tram sector. China has developed a domestic market for the promotion and use of new energy vehicles, and the government incentivizes manufacturers and consumers to invest in these vehicles by building extensive charging infrastructures, offering tax breaks, and offering subsidy programs. In addition to increasing the local car industry's competitiveness abroad, this tactic has created China the world's biggest market for electric automobiles. Furthermore, China's quick development of new energy vehicles has given it more negotiating power in the US-China trade spat. China's new energy vehicle industry has formed a complete industrial chain, including battery manufacturing, electric motor technology and related electronic control systems, which are important factors for China to further expand and enhance its competitiveness in the international market.

In recent years, shared motorcycles have become a green choice for short- and medium-distance travel in cities, significantly improving transport efficiency and helping to build low-carbon cities. According to the 2019 Green Industry Guidance Catalogue, shared motorcycles are included in the development of green industries and are strongly encouraged by the policy. This strategy not only responds to the global trend of carbon reduction but also creates huge opportunities for the shared motorcycle market. Take Meituan motorbike as an example, its low-carbon emission reduction effect is remarkable. Research shows that Meituan e-motorcycle can reduce carbon emissions by 409,000 tones per year, which is equivalent to planting 8.18 million trees or saving the carbon emissions of 150,000 cars for one year. In addition, Meituan e-motorcycles practice the concept of "whole life cycle" environmental protection, and their recycled tires are used to make plastic pitches, further demonstrating their commitment to environmental protection. Shared motorcycles meet the daily commuting needs of urban residents, and are significantly more efficient than traditional cars, especially for trips within 5 kilometers, effectively reducing urban traffic congestion. In addition, shared motorcycles have become the preferred choice for night-time travel in several cities, especially when public transport is out of service, it provides a fast and convenient transport solution. Shared motorcycles not only promote the green transformation of the transport industry, but also contribute to sustainable economic growth, becoming an important part of the modern urban transport system.

5. ANSWER RESEARCH QUESTIONS

The most important aspects of Sino-US trade for the Chinese economy for Research Question 1 consist of two main dimensions: direct trade exchanges and technology transfers. These aspects of trade have had a profound impact on China's macroeconomy and specific industries. First, direct exchanges of goods and services have significantly impacted China's export-oriented industries, which dominate U.S.-China trade. Second, the development of information technology and green technology enabled through the trade war has accelerated China's technological innovation and industrial upgrading in these areas. For research question 2: The trade conflict between the US and China has complicated matters regarding China's ability to meet its objectives for carbon emissions and carbon neutrality. China has accelerated the study, development, and deployment of environmentally friendly technology as a result of the trade war, notably in the manufacturing and energy sectors, in order to reduce its dependence on external resources and improve the industry's capacity for independent innovation. On the other hand, the conflict has also prompted the Government of China to adjust relevant environmental policies of the domestic industrial structure, in particular to promote low-carbon development and enhance the use of renewable energy.

6. CONCLUSION AND DISCUSSION

In the context of the current international trade environment and economic forecasts, China's foreign direct investment (FDI) in the United States has significantly contributed to domestic GDP growth. This investment not only drives economic growth, but also promotes technological exchange and industrial upgrading to a certain extent. This study confirms through regression model analysis that there is a significant positive association between China's economic growth and inward investment.

Especially under the influence of external uncertainties such as trade wars, FDI has become a key force driving China's robust economic development.

When considering the relationship between FDI and domestic economic growth, policymakers need to recognize the important role that such investment plays in raising the technological level and global competitiveness of domestic industries. Therefore, future policy adjustments are likely to place greater emphasis on attracting and utilizing FDI, especially in high-technology and green energy sectors. In addition, the existence of trade wars may prompt policymakers to adjust their trade and investment strategies to reduce the impact of external shocks on the domestic economy, and may also explore ways to optimise the investment environment by improving trade relations (Qin et al., 2022).

The trade war between the United States and China has had a broad and far-reaching impact on the Chinese economy. From a macroeconomic perspective, the increased tariff measures have significantly reduced China's trade exports and economic growth rate, and accelerated the restructuring and relocation of domestic industries. Although the direct impact of the U.S.-China trade war on energy security has been relatively limited, it provides an opportunity to strengthen U.S.-China energy cooperation, which has the potential to become a positive factor in bilateral relations. While the trade war puts pressure on China's economy in the short term, in the long term it may prompt China to accelerate its shift from high-carbon energy dependence to cleaner, renewable energy sources. Such a shift would not only help reduce environmental pollution and greenhouse gas emissions, but also boost the domestic high-tech and green energy industries, which could bring new growth points to the economy. In addition, strengthening co-operation with the US in renewable energy technologies and other green technologies will not only enhance China's competitiveness in the international arena, but also help promote technological innovation and industrial upgrading, which is crucial to achieving the goal of carbon neutrality. Thus, while the trade war between the United States and China poses many challenges, it also provides opportunities for China to transform its environmental policies and economy to drive economic growth in a more sustainable manner.

The analysis shows that the increase in Chinese direct investment (FDI) in the United States has significantly contributed to China's economic growth. Not only may high-tech and managerial skills increase the competitiveness of Chinese businesses, but they can also facilitate the optimization of the country's economic structure. China's move toward carbon neutrality has accelerated due to the US-China trade conflict. China has improved its research, development, and use of environmental protection technologies particularly in clean energy and carbon capture and storage technologies through changes in policy and technical innovation. Hypothesis 2 also maintains that these actions not only alter China's industrial and energy balance but also set the stage for the country to become carbon neutral by 2060.

6.1. Limitations

Due to the limited sample size and insufficient available official data, this study may not be able to fully capture the complex impacts of the U.S.-China trade war on different industries and regions in China. In addition, the model may fail to account for unobserved confounding factors such as policy changes, international market volatility, and the impact of the COVID-19 epidemic, which may affect both economic growth and carbon emissions in China, leading to biased estimates. In addition, standards for measuring carbon emissions vary by country and region, leading to challenges in the comparability of data sources. In particular, carbon emissions data obtained from China may deviate somewhat from those commonly used internationally. Furthermore, the current model does not adequately consider the time lag effect of policy or economic changes on carbon emissions and economic growth. Studies that combine the objective of carbon neutrality with the U.S.-China trade war are particularly uncommon, given the notion of carbon neutrality has only been established in China for a very short period of time, making the official literature on the subject inadequate. All these limitations may affect the accuracy and reliability of the study results.

6.2. Recommendations for future study

To analyze the impact of the US-China trade war more accurately, future research should consider doing the analysis using more comprehensive data and more complex models that can better deal with the dynamic relationship and endogeneity between variables. The U.S.-China trade war is not only affected by bilateral relations but also by the global economic and political environment. Future research should incorporate global economic indicators, international political events, and other factors to comprehensively assess how they indirectly affect China's economic and environmental policies through the trade war. Some important information about the relationship between carbon emissions and economic development under green trade policies has been excluded from this study and future research should rather explore how green deals under the policies can increase economic growth and move from a high-carbon economy to a sustainable low-carbon development model.

7. SUMMARY

The innovation of this paper is the rare combination of the U.S.-China trade war and China's carbon-neutral development, which has not been mentioned in much of the literature. By integrating data from multiple sources and adopting a quantitative analysis methodology, this study not only reveals how the U.S.-China trade war has impacted the domestic and international economic environments by altering the country's industrial structure and technological advancement paths, but also explores how the external shock has contributed to the acceleration of China's transition to carbon-neutral status. neutral transition.

Based on the above analyses and discussions, this paper highlights the need for China to enhance its attractiveness to foreign direct investment (FDI) while pursuing economic growth, especially in promoting the development of green and low-carbon technologies. This will not only contribute to the optimization and upgrading of the economic structure, but also ensure China's leadership in global climate change mitigation and turn external challenges such as trade wars into opportunities to promote economic transformation and sustainable development. In addition, improving and stabilizing the trade relationship between the United States and China will be key to ensuring China's sustainable economic development and achieving its carbon neutrality goal.

REFERENCES

[1] Abbasi, M. A., Nosheen, M., & Rahman, H. U. (2023). An approach to the pollution haven and pollution halo hypotheses in Asian countries. Environmental Science and Pollution Research, 30(17), 49270-49289. https://doi.org/10.1007/s11356-023-25548-x

[2] Bayer, N (2022). Foreign direct investment in the China-US economic security dilemma. Frankfurt Working Papers on East Asia. https://www.goethe-university-frankfurt.de/126658564/FWPEA_12-22_Bayer_pdf1.pdf?

[3] Bekkers, E., & Schroeter, S. (2020). An economic analysis of the US-China trade conflict (No. ERSD-2020-04). World Trade Organization. https://www.wto.org/english/res_e/reser_e/ersd202004_e.htm

[4] Cerutti, E., Gopinath, G., & Mohommad, A. (2019, May 23). The impact of US-China trade tensions. IMF Blog. https://www.imf.org/en/Blogs/Articles/2019/05/23/blog-the-impact-of-us-china-trade-tensions

[5] Chen, H., Yi, J., Chen, A., Peng, D., & Yang, J. (2023). Green technology innovation and CO2 emission in China: Evidence from a spatial-temporal analysis and a nonlinear spatial durbin model. Energy Policy, 172, 113338. https://doi.org/10.1016/j.enpol.2022.113338

[6] Chen, J., Huang, T., Xie, X., Lee, P. T. W., & Hua, C. (2019). Constructing governance framework of a green and smart port. Journal of Marine Science and Engineering, 7(4), 83. https://doi.org/10.3390/jmse7040083

[7] Chen, Z., Feng, X., & He, Z. (2022). A key to stimulate green technology innovation in china: the expansion of high-speed railways. International Journal of Environmental Research and Public Health, 20(1), 347. https://doi.org/10.3390/ijerph20010347

[8] Chia, T. (2022). How China is winning the race for clean energy technology. Fairbank Center for Chinese Studies. https://fairbank.fas.harvard.edu/research/blog/how-china-is-winning-the-race-for-clean-energy-technology%ef%bf%bc/

[9] China Council for International Cooperation on Environment and Development (CCICED) Secretariat. (2023). Major Green Technology Innovation and Implementation Mechanism. In Green Recovery with Resilience and High Quality Development. Springer. https://doi.org/10.1007/978-981-19-9470-8_6

[10] Chor, D., & Li, B. (2024). Illuminating the effects of the US-China tariff war on China's economy. Journal of International Economics, 103926. https://www.nber.org/system/files/working_papers/w29349/w29349.pdf

[11] Chou, J., Yang, F., Wang, Z., & Dong, W. (2021). The Impact on carbon emissions of China with the trade situation versus the US. Sustainability, 13(18), 10324. https://doi.org/10.3390/su131810324

[12] Chu, Y., Cui, H., & He, H. (2023). Nine trends in the development of China's electric passenger car market. The International Council on the Clean Transportation. https://theicct.org/publication/passenger-cars-china-trends-market-mar23/

[13] Dai, F., Kahrl, F., Gordon, J. A., Perron, J., Chen, Z., Liu, Z., Yu, Y., Zhu, B., Xie, Y., Yuan, Y., Hu, Y., & Wu, Y. (2023). U.S.-China coordination on carbon neutrality: an analytical framework. Climate Policy, 23(7), 929–943. https://doi.org/10.1080/14693062.2023.2200379

[14] Duan, Y., & Jiang, X. (2021). Pollution haven or pollution halo? A Re-evaluation on the role of multinational enterprises in global CO2 emissions. Energy Economics, 97, 105181. https://doi.org/10.1016/j.eneco.2021.105181

[15] Fajgelbaum, P. D., & Khandelwal, A. K. (2022). The economic impacts of the US–China trade war. Annual Review of Economics, 14, 205-228. https://doi.org/10.1146/annurev-economics-051420-110410

[16] Gao, J., Gao, F., Yin, B., & Zhang, M. (2021). International trade as a double-edged sword: The perspective of carbon emissions. Frontiers in Energy Research, 9, 764914. https://doi.org/10.3389/fenrg.2021.764914

[17] Gao, P., Wang, Y., & Yang, X. (2022). Green technology innovation and carbon emissions nexus in China: Does industrial structure upgrading matter?. Frontiers in Psychology, 13, 951172. https://doi.org/10.3389/fpsyg.2022.951172

[18] Gechev, V. (2021). Political shadows in the USA-China trade dispute. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3758750

[19] Globerman, S., & Shapiro, D. (2009). Economic and strategic considerations surrounding Chinese FDI in the United States. Asia Pacific Journal of Management, 26(1), 163-183. https://doi.org/10.1007/s10490-008-9112-5

[20] Gong, T. (2020). Chinese direct investment in the United States under the Trump administration and Sino-US economic and trade frictions. China Institute of International Studies. https://www.ciis.org.cn/yjcg/xslw/202009/t20200928_7536.html

[21] Gosens, J., Kåberger, T., & Wang, Y. (2017). China's next renewable energy revolution: Goals and mechanisms in the 13th Five Year Plan for energy. Energy Science & Engineering, 5(3), 141-155. https://doi.org/10.1002/ese3.161

[22] Heath, T. R. (2018). China's pursuit of overseas security (p. 22). Rand Corporation. https://www.rand.org/content/dam/rand/pubs/research_reports/RR2200/RR2271/RAND_RR2271.pdf

[23] Hepburn, C., Qi, Y., Stern, N., Ward, B., Xie, C., & Zenghelis, D. (2021). Towards carbon neutrality and China's 14th Five-Year Plan: Clean energy transition, sustainable urban development, and investment priorities. Environmental Science and Ecotechnology, 8, 100130–100130. https://doi.org/10.1016/j.ese.2021.100130

[24] Huld, Arendse. (2023, February 15). US-China trade in goods hits new record in 2022 – what does it mean for bilateral ties? China Briefing. https://www.china-briefing.com/news/us-china-trade-in-goods-hits-new-record-in-2022-what-does-it-mean-for-bilateral-ties/

[25] Khan, M. A., & Khan, S. M. (2022). US China trade war: Implications for the World. Global International Relations Review, 2, 10-18. https://www.humapub.com/admin/alljournals/girr/papers/gbZEjOakyb.pdf

[26] Lei, Y., Zhang, X., Yao, C., & Peng, W. (2023). Redesigning carbon emissions reduction policies for China's manufacturing industry: a dynamic stochastic general equilibrium approach. Frontiers in Energy Research, 11. https://doi.org/10.3389/fenrg.2023.1094700

[27] Li, H. (2023). Advancing "carbon peak" and "carbon neutrality" in China: A comprehensive review of current global research on carbon capture, utilization, and storage technology and its implications. ACS omega, 8(45), 42086-42101. https://doi.org/10.1021/acsomega.3c06422

[28] Liu, Z., Deng, Z., He, G., Wang, H., Zhang, X., Lin, J., Qi, Y., & Liang, X. (2022). Challenges and opportunities for carbon neutrality in China. Nature Reviews Earth & Environment, 3(2), 141-155. https://doi.org/10.1038/s43017-021-00244-x

[29] Long, S., Zhang, R., & Hao, J. (2022). Asymmetric impact of Sino-US interest rate differentials and economic policy uncertainty ratio on RMB exchange rate. Journal of International Financial Markets, Institutions and Money, 78, 101570. https://doi.org/10.1016/j.intfin.2022.101570

[30] Lu, J., Mao, X., Wang, M., Liu, Z., & Song, P. (2020). Global and national environmental impacts of the US–China Trade War. Environmental Science & Technology, 54(24), 16108-16118. https://doi.org/10.1021/acs.est.0c03863

[31] Lu, K., & Biglaiser, G. (2020). The politics of Chinese foreign direct investment in the USA. Journal of Asian and African Studies, 55(2), 254-272. https://doi.org/10.1177/0021909619874816

[32] Ma, Y. (2023). A Regional Analysis of China's Environmental Issues. Modern Geográfia, 18(2), 97-120. https://doi.org/10.15170/MG.2023.18.02.07

[33] Mohammed Sanajira. (2024, February 5). Tesla failed. How did China's BYD become the world's electric vehicle giant?. Aljazeera. https://chinese.aljazeera.net/economy/2024/2/5/

[34] Nymalm, N. (2022). China's rise and rethinking International Relations theory: Edited by Chengxin Pan and Emilian Kavalski, Bristol University Press, 2022. International Affairs, 98(5), 1785. https://doi.org/10.1093/ia/iiac175

[35] Osuntuyi, B. V., & Lean, H. H. (2022). Economic growth, energy consumption and environmental degradation nexus in heterogeneous countries: Does education matter?. Environmental Sciences Europe, 34(1), 48. https://doi.org/10.1186/s12302-022-00624-0

[36] Park, S. (2020). Trade conflict between the US and China: What are the impacts on the Chinese economy. International Organisations Research Journal, 15(2), 153-168. https://iorj.hse.ru/data/2020/10/13/1373347290/Park.pdf

[37] Qin, B., Gai, Y., Ge, L., Sun, P., Yu, Y., & Zheng, Y. (2022). FDI, technology spillovers, and green innovation: Theoretical analysis and evidence from China. Energies, 15(20), 7497. https://doi.org/10.3390/en15207497

[38] Sarkodie, S. A., & Strezov, V. (2018). Empirical study of the environmental Kuznets curve and environmental sustainability curve hypothesis for Australia, China, Ghana and USA. Journal of cleaner production, 201, 98-110. https://doi.org/10.1016/j.jclepro.2018.08.039

[39] Shi, C., Zhi, J., Yao, X., Zhang, H., Yu, Y., Zeng, Q., Li, L. & Zhang, Y. (2023). How can China achieve the 2030 carbon peak goal—a crossover analysis based on low-carbon economics and deep learning. Energy, 269, 126776. https://doi.org/10.1016/j.energy.2023.126776

[40] Song, S., Zhao, S., Zhang, Y., & Ma, Y. (2023). Carbon emissions from agricultural inputs in China over the past three decades. Agriculture, 13(5), 919. https://doi.org/10.3390/agriculture13050919

[41] Stern, D. I. (2014). The environmental Kuznets curve: A primer. https://doi.org/10.22004/ag.econ.249424

[42] Tao, Y., Yang, W., Ye, Y., & Kong, D. (2023). The shock of Us-China trade war and job market: Downstream shrinkage and upstream employment. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4517523

[43] Thoms, Anahita (2019, November 1). Why trade wars have no winners. World Economic Forum. https://www.weforum.org/agenda/2019/11/who-benefits-from-a-trade-war/

[44] Wang, B., Yu, J., & Wu, R. (2022). Achieving carbon neutrality in China: Legal and policy perspectives. Frontiers in Environmental Science, 10, 1043404. https://doi.org/10.3389/fenvs.2022.1043404

[45] Wang, P., Pang, S., & Li, G. (2019, February). An analysis of the causes of the Sino-US trade war. In 2019 4th International Conference on Financial Innovation and Economic Development (ICFIED 2019) (pp. 346-349). Atlantis Press. file:///Users/zhengshuyu/Downloads/55914132.pdf

[46] Wang, P., Shi, B., Li, N., Kang, R., Li, Y., Wang, G., & Yang, L. (2023). CCUS development in China and forecast its contribution to emission reduction. Scientific Reports, 13(1), 17811. https://www.nature.com/articles/s41598-023-44893-y

[47] Wang, Q., & Li, L. (2021). The effects of population aging, life expectancy, unemployment rate, population density, per capita GDP, urbanization on per capita carbon emissions. Sustainable Production and Consumption, 28, 760-774. https://doi.org/10.1016/j.spc.2021.06.029

[48] Wang, Y., Guo, C., Chen, X., Jia, L., Guo, X., Chen, R., Zhang, M., Chen, Z., & Wang, H. (2021). Carbon peak and carbon neutrality in China: Goals, implementation path and prospects. China Geology, 4(4), 720–746. https://doi.org/10.31035/cg2021083

[49] Wei Tao. (2018, March 27). The US-China trade war: Impact analysis from maro to sector. Pacific Securities. https://pdf.dfcfw.com/pdf/H3_AP201803281112511873_1.pdf

[50] Wei, H., Lian, H. (2020). Import competition from the United States and employment of chinese manufacturing enterprises. Journal of Finance and Economics, 2020, 46(8), 4-18. https://qks.shufe.edu.cn/j/PDFFull/438a76a2-ef51-47d9-ac87-23d6d9a430d0.pdf

[51] Wei, Y. M., Chen, K., Kang, J. N., Chen, W., Wang, X. Y., & Zhang, X. (2022). Policy and management of carbon peaking and carbon neutrality: A literature review. Engineering, 14, 52-63. https://doi.org/10.1016/j.eng.2021.12.018

[52] Xu, J., Guan, Y., Oldfield, J., Guan, D., & Shan, Y. (2024). China carbon emission accounts 2020-2021. Applied Energy, 360, 122837. https://doi.org/10.1016/j.apenergy.2024.122837

[53] Žemaitytė, S., & Urbšienė, L. (2020). Macroeconomic effects of trade tariffs: A case study of the US-China trade war effects on the economy of the United States. Organizations and markets in emerging economies, 11(2), 305-326. https://doi.org/10.15388/10.15388/OMEE.2020.11.35

[54] Zhao, F., Bai, F., Liu, X., & Liu, Z. (2022). A review on renewable energy transition under China's carbon neutrality target. Sustainability, 14(22), 15006. file:///Users/zhengshuyu/Downloads/sustainability-14-15006-v2.pdf

[55] Zhao, X., Ma, X., Chen, B., Shang, Y., & Song, M. (2022). Challenges toward carbon neutrality in China: Strategies and countermeasures. Resources, Conservation and Recycling, 176, 105959. https://doi.org/10.1016/j.resconrec.2021.105959

[56] Zhou, Jialan. (2023). Topic: Environmental Impacts of the US-China Trade War and Possible Solutions. BCP Business & Management, 38, 3202-3208. https://doi.org/10.54691/bcpbm.v38i.4253

[57] Zreik, M. (2023). China-US relations under the new economic order: The case for the US Withdrawal from the trans-pacific partnership agreement. Journal of Asia Pacific Studies, 7(1). https://openurl.ebsco.com/EPDB%3Agcd%3A12%3A27721548/detailv2?sid=ebsco%3Aplink%3Ascholar&id=ebsco%3Agcd%3A162399801&crl=c