

# **STRATEGIC ENGAGEMENT WITH SDGS IN CHINA'S SEMICONDUCTOR SECTOR: COMPLIANCE, PERFORMANCE ENHANCEMENT, AND NATIONAL POLICY**

**Zhu ZHANG<sup>1</sup>**

*<sup>1</sup>Assistant Professor of Politics, Fairfield University, USA*

## **Abstract**

This paper explores how China, as an authoritarian regime, has strategically utilized its private sector to enhance its global image by aligning with Sustainable Development Goals (SDGs). While much of the existing research on state-business relations in China emphasizes state control, this paper sheds light on the often-overlooked symbiotic relationship between the government and private companies. The interplay between state mandates and corporate innovation not only enhances financial performance, as reflected in companies' equity market valuations, but also elevates China's global reputation. Drawing on Environmental, Social, and Governance (ESG) reports from the top 100 Chinese semiconductor companies, this analysis highlights the role of corporate sustainability efforts in bolstering the country's global standing. Case studies of firms like SMIC and BYD illustrate the significant advantages of aligning with SDGs, emphasizing the crucial role of China's "whole-nation system" in promoting sustainable technological advancement. This analysis provides a fresh perspective on the rapid expansion of China's tech sector and highlights the more nuanced and interdependent relationship between the state and private enterprise.

## **Keywords**

China Semiconductor Industry; Sustainable Development Goals (SDGs); Innovation Government Policy; Company Compliance; Performance Enhancement

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## **Introduction**

The semiconductor industry, a cornerstone of modern technology, is essential for global economic progress. In China, a rising global tech powerhouse, this sector not only fuels economic growth but also contributes to achieving the United Nations' Sustainable Development Goals (SDGs) (Hsieh et al. 2023). Recently, China's semiconductor industry has intensified its engagement with SDGs, driven by government mandates that reveal a complex interplay between business performance and national policy. As an authoritarian regime, China exerts tight control over key industries, yet the relationship between the state and private companies is more nuanced than simple dominance. The semiconductor sector illustrates how the Chinese government strategically collaborates with private enterprises to achieve both national and global objectives, blending state-led initiatives with corporate innovation to advance technological progress and strengthen China's global reputation in sustainability. This paper examines this dynamic relationship, arguing that it is often mutually beneficial: government mandates and incentives encourage private companies to innovate and comply with sustainability goals, resulting in improved financial performance and supporting China's efforts to project an image of responsible global leadership.

This paper draws on Environmental, Social, and Governance (ESG) reports from the top 100 Chinese semiconductor companies, which provide a rich source of data on their alignment with SDGs. These reports offer detailed insights into how these companies integrate sustainability into their operations, reflecting broader national objectives. While the ESG reports provide valuable insights into how Chinese semiconductor companies present their sustainability efforts, they do not always equate to actual performance in achieving SDGs. These reports often emphasize compliance with state mandates and corporate policies rather than providing a comprehensive assessment of on-the-ground outcomes. However, even if ESG reports may not fully reflect the companies' SDGs performance, they still offer crucial data points that highlight how companies are responding to government incentives and pressures.

In addition, case studies of leading semiconductor companies, such as Semiconductor Manufacturing International Corporation (SMIC) and BYD Semiconductor, further demonstrate the tangible benefits of aligning with SDGs. These companies serve as prime examples of how China's "whole-nation system" fosters an environment where state-driven policies and corporate innovation converge. By aligning their business strategies with national sustainability goals, these firms are able to achieve financial gains, as evidenced by improved stock performance and increased investment appeal. The case studies provide concrete evidence of the effectiveness of this model in promoting sustainable technological advancement, contributing to the broader success of China's semiconductor sector.

This research contributes to the existing literature by offering a nuanced understanding of the relationship between the Chinese state and the private sector, particularly within the rapidly growing semiconductor industry. By examining the strategic alignment of private companies with SDGs under the influence of China's state-led development model, this paper challenges the conventional view that authoritarian control is a one-way mechanism of dominance. Instead, it highlights the interdependence between state-driven mandates and corporate innovation, showing how this synergy benefits both the government's national objectives and the financial success of private enterprises. Of course, this paper does not promote China's authoritarian governance model; rather, it seeks to provide insights into how state-business relations function in China and to offer comparative points for understanding similar or completely different dynamics in other countries. Ultimately, this research contributes to a deeper understanding of how China's tech industry thrives under a state-led development model, with broader implications for state-business relations in other contexts and the role of national policies in driving corporate alignment with global sustainability initiatives.

This paper is organized into five sections. The first section explores how government compliance drives corporate strategy in the semiconductor industry. The second section analyzes how state support reinforces corporate efforts toward sustainability. The third section examines the impact of SDGs alignment on companies' financial performance and reputation. The fourth section highlights the role of innovation in advancing SDGs achievements. The last section concludes the paper by synthesizing the findings and discussing the broader implications for state-business relations authoritarian regimes.

## **Government Compliance as a Catalyst for Corporate Strategy**

China's semiconductor industry has undergone a remarkable transformation, evolving from a sector heavily reliant on foreign technology to one that is increasingly self-sufficient and innovative (Goodrich 2024). This transformation has been largely driven by governmental policies and initiatives (Chou, Chang and Li 2014; Bown 2020). The inception of China's semiconductor industry can be traced back to the late twentieth century when the country primarily depended on foreign technology for its semiconductor needs. This dependence was a significant motivator for China to develop its semiconductor sector. The turning point came with the implementation of strategic initiatives like the "Made in China 2025" plan, which emphasized the development of high-tech industries, including semiconductors.

"Made in China 2025" marked a decisive shift in China's approach to its semiconductor industry. The initiative, aimed at upgrading China's manufacturing base, identified semiconductors as a key sector for national development. The government's commitment was evident in the substantial investments in R&D, leading to breakthroughs in semiconductor design and manufacturing technologies (Klaus 2003). This push towards self-sufficiency was not just about technological prowess but also about reducing China's vulnerability to external supply chain disruptions and geopolitical tensions.

Concurrent with these developments, there has been a growing integration of SDGs into China's semiconductor industry. This integration is driven by both domestic and international needs: domestically, it aligns with China's broader goals of reducing environmental impact and promoting green technologies, which are central to President Xi Jinping's campaign on environmental protection and sustainability (Young 2022). Internationally, the adherence to SDGs will enhance the global competitiveness of Chinese semiconductor firms by meeting the increasing demands for sustainable practices from international markets and stakeholders. This is especially crucial in the context of the ongoing US-China chip war, where sustainability efforts may serve as a strategic advantage for China in the long run. More broadly, this approach also aligns with China's ambitions to take on a leadership role in global climate change and environmental initiatives, reinforcing its image as a responsible global power committed to sustainable development (Qi and Dauvergne 2022).

There are three major SDGs that are highly relevant to the semiconductor industry: innovation, and sustainable cities (SDG 9), responsible consumption and production (SDG 12), and climate action (SDG 13). In the context of China, the alignment of the three has been both a response to global sustainability trends and a part of the national strategy for technological advancement (Kuo, Kuo, and Chen 2022). According to the ESG reports of Chinese semiconductor companies, key areas where SDGs are being integrated into the industry include:

- 1) Innovation and Industry (SDG 9): The semiconductor industry's commitment to innovation directly contributes to SDG 9, which emphasizes building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation. Advancements in semiconductor technology, such as the development of energy-efficient chips and the adoption of smart manufacturing processes, are vital in this regard.
- 2) Responsible Consumption and Production (SDG 12): The semiconductor industry has been focusing on sustainable manufacturing practices, including minimizing electronic waste and improving resource efficiency. These practices align with SDG 12's objectives of ensuring sustainable consumption and production patterns.
- 3) Climate Action (SDG 13): Given the energy-intensive nature of semiconductor manufacturing, the industry has a significant role in climate action. Efforts to reduce greenhouse gas emissions and enhance energy efficiency in production processes are critical to meeting the targets of SDG 13.

To target all three goals, Chinese government policies play a pivotal role in shaping corporate strategies. The government's increasing focus on sustainability and ESG reporting has driven companies to align their operations with these directives (Lie et al. 2022; VerWey 2019). This alignment is not simply a regulatory requirement but reflects China's unique governance model, where state directives are deeply integrated into corporate governance, influencing both operational decisions and long-term business strategies. Since the early 2000s, Chinese government has implemented a range of policies aimed at aligning the semiconductor industry with the broader objectives of the SDGs (Chinese Academy of Science 2022). These policies have evolved over time, reflecting the changing priorities of both the industry and global sustainability trends. Here are key policies that the Chinese government has issued to address the three major SDGs related to the semiconductor industry:

- 1) Industry, Innovation, and Infrastructure (SDG 9)
  - i) "Made in China 2025" (2015): This strategic plan focuses on upgrading China's manufacturing capabilities, with semiconductors identified as a priority sector. It promotes innovation and aims to reduce China's dependency on foreign technology.
  - ii) "National Integrated Circuit Industry Development Guidelines" (2014): These guidelines provide a framework for boosting domestic semiconductor manufacturing, with significant investments in R&D and infrastructure.
  - iii) "13th and 14th Five-Year Plans (2016-2020 and 2021-2025)": These plans emphasize innovation-driven development, support for the semiconductor industry, and the promotion of advanced manufacturing infrastructure across China.
- 2) Responsible Consumption and Production (SDG 12)
  - i) "Circular Economy Promotion Law" (2008, amended in 2020): This law encourages resource recycling and sustainable production practices across industries, including semiconductors, to reduce environmental impact and improve efficiency.
  - ii) "Green Manufacturing Initiative" (2016): This initiative aims to promote sustainable manufacturing practices, reduce waste, and encourage the use of environmentally friendly materials in semiconductor production.
  - iii) "Action Plan for Pollution Prevention and Control of Key Industries" (2020): This policy targets industries, including electronics and semiconductors, with guidelines to reduce emissions, waste, and pollution through cleaner production technologies.
- 3) Climate Action (SDG 13)
  - i) "China's Nationally Determined Contributions" (NDCs) (2016, updated in 2021): These commitments outline China's efforts to reduce carbon emissions and promote renewable energy, with the semiconductor industry playing a key role in developing energy-efficient technologies.
  - ii) "Energy Conservation Law" (2007, amended in 2021): This law mandates energy-saving practices across all industries, including semiconductors, encouraging the adoption of energy-efficient production technologies.
  - iii) "Carbon Neutrality by 2060 Pledge" (2020): As part of this goal, China has pledged to achieve peak carbon emissions by 2030 and carbon neutrality by 2060, with the semiconductor industry expected to contribute by advancing energy-saving technologies and reducing its carbon footprint.

From these policies, it is evident that the government has been instrumental in steering the semiconductor industry toward SDGs alignment through a strategic mix of policies, incentives, and regulations. By establishing a clear policy framework, the government has encouraged companies in the semiconductor sector to adopt sustainable practices. These efforts include targeted measures to reduce carbon emissions, enhance energy efficiency, and promote sustainable manufacturing processes. Initiatives such as subsidies for sustainable technologies, stringent regulations for environmental protection, and extensive support for R&D in green technologies have played a pivotal role in pushing companies to embrace SDG-aligned practices (Allen 2023). The governmental backing became a significant incentive for companies to engage with environmental responsibility through innovation, or at least to address it.

For private sector companies in China, reading, addressing, and meeting the government's needs is not just a consideration but a key business strategy. In other words, government policy in China goes beyond being a regulatory framework; it often serves as a directive that influences the core of business strategy. For semiconductor companies, aligning with government expectations is not merely about compliance; it is a strategic move. This alignment ensures smooth operations, access to government grants, and, crucially, the favor of the government—a critical factor in determining success in a highly competitive landscape (Aken and Lewis 2015). By adhering to government directives, companies secure their standing with key government stakeholders, ensuring ongoing access to vital resources and support (Zhang and Liu 2020).

Figure One provides a visual representation of the ESG reports publication status among top 100 Chinese semiconductor companies in 2023. It divides the companies into three distinct categories based on whether they have published an ESG report, have not published an ESG report, or if their status is unknown. A significant majority, represented in light green, shows that 70% of these companies have published their ESG reports. This high percentage suggests a strong inclination towards transparency and accountability in ESG aspects within the Chinese semiconductor industry. Represented in light coral, this sizable portion indicates that 29% of the companies have not published their ESG reports. This segment might include companies that are either in the process of developing their ESG strategies or those that have not yet prioritized ESG reporting. A small fraction, shown in light blue, accounts for companies whose ESG reporting status is unknown. This could include newly established firms or those for which data is not readily available or is ambiguous.

ESG Report Status of Chinese Semiconductor Companies

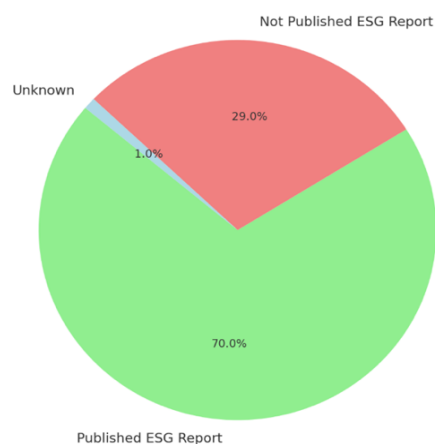


Figure One: Chinese Semiconductor Publish Their ESG Reports

The ESG report primarily indicates companies' awareness and direct response to government policies rather than a purely voluntary commitment to sustainability. It highlights how these firms are driven by the state's directives to demonstrate compliance and alignment with national goals. However, this alignment is not necessarily an indication of deep-rooted corporate cultural change but more a reflection of the need to meet regulatory expectations and secure state support. Overall, there is a strong trend towards ESG reporting in China's semiconductor sector, reflecting an increasing awareness and commitment to sustainable and responsible business practices. Government compliance serves as a powerful catalyst for this shift, driving companies to integrate ESG considerations into their corporate strategies as part of a broader alignment with state policies and sustainability goals.

### State Support as a Reinforcement Mechanism

Along with government mandates, the Chinese government provides substantial support to semiconductor companies that actively address SDGs, a well-documented practice (VerWey 2019; Kratz and Oertel 2021; Chou, Chang, and Li 2014). This support includes tax breaks, subsidized access to cutting-edge technology, and preferential treatment in government procurement policies, all aimed at reducing the financial burden of sustainability transitions. Additionally, government-backed funding programs offer critical resources for research and development, enabling companies to innovate while meeting SDGs-related objectives. The synergy between the state and businesses in China ensures that compliance with government regulations translates into tangible benefits.

Recently, *Ijiwei* Network compiled a comprehensive dataset revealing that in 2022, the Chinese government allocated 12.1 billion yuan in subsidies to approximately 190 publicly listed semiconductor companies

on the A-share market.<sup>1</sup> Notably, the top ten recipients among these companies accounted for a substantial portion, receiving a combined total of 5.4 billion yuan in government subsidies. This significant financial support has drawn considerable attention, resonating not just within domestic circles but also in international media spheres.

Comparatively, when the data from *Ijiwei* is juxtaposed with my analysis, it is observed that a significant portion, specifically 90% of these companies, have published their ESG reports. The convergence of these two datasets highlights a crucial aspect of China's semiconductor industry: while the government is actively supporting these companies financially, a substantial majority of them are also increasingly engaged in sustainable and responsible business practices, as evidenced by their ESG disclosures. Of course, ESG reporting might be just one factor in the government's decision to provide substantial support, but addressing the SDGs is definitely a common feature among all these companies. This dual approach of financial backing and self-regulated sustainability reporting underscores the industry's balanced focus on economic growth and adherence to sustainable development goals.

Taking these new fabless semiconductor companies (Table One) as an example, they have thrived under substantial government support, which has been a driving force behind their growth and success (Hinrich Foundation 2020). Regarding environmental impact, fabless semiconductor companies, such as those listed, design chips but outsource their manufacturing to specialized foundries. This business model can potentially reduce the environmental footprint compared to integrated device manufacturers, which handle both design and production in-house. The lower direct environmental impact of fabless companies is primarily because they do not operate energy-intensive fabrication plants. This approach allows these companies to focus on innovation and design, while the environmental responsibilities and challenges of manufacturing are managed by the foundries.

As illustrated in Table One, fabless semiconductor companies in China benefit greatly from the backing of both the government and state-owned enterprises (SOEs). This support is a critical factor in their success, especially in an industry as capital-intensive and technologically demanding as semiconductors. The Chinese government provides direct financial incentives, including tax breaks, grants, and access to subsidized technologies, to encourage innovation and reduce dependence on foreign technology. In addition to financial support, many fabless companies are also strategically linked to SOEs, which provide critical market opportunities and resources. For instance, companies like Nari Smart Chip, which supplies the state-controlled utility firm State Grid, benefit from steady demand and favorable procurement policies. Similarly, state-backed investors often play a role in acquiring and integrating key foreign technologies into Chinese firms, as seen with Tsinghua Unigroup's acquisitions.

Company	Background	Revenue
HiSilicon	Subsidiary of telecom giant Huawei	\$3.87 billion
Tsinghua Unigroup	Government-backed group that acquired Spreadtrum and RDA	\$1.86 billion
Omnivision	Founded in California and sold to Chinese investors in 2015	\$893 million
ZTE Microelectronics	Subsidiary of leading telecom firm ZTE	\$506 million
CEC Huada	Subsidiary of central government-controlled enterprise	\$506 million
Nari Smart Chip	Main supplier to government-controlled utility firm State Grid	\$478 million

**Table One: Top Chinese Fabless Semiconductor Companies by Revenue**

Another notable example that illustrates the Chinese government's commitment to integrating SDGs into the semiconductor industry is the case of Semiconductor Manufacturing International Corporation (SMIC). SMIC is one of China's leading semiconductor foundries and has been at the forefront of the country's drive towards developing a self-sufficient semiconductor industry. SMIC, headquartered in Shanghai, has been operating under the intense pressure of not only maintaining competitiveness in the global semiconductor market but also adhering to China's stringent policies on environmental protection and sustainability (Triolo 2024).

In alignment with the Chinese government's "Made in China 2025" initiative and sustainability-focused policies, SMIC has made concerted efforts to mitigate its environmental impact while continuing its core business of chip manufacturing. These efforts have been supported by government incentives, including tax reductions for high-tech enterprises that meet sustainability standards, reducing the tax rate from 25% to 15% (Zhou 2023). SMIC's initiatives include energy conservation projects, improvements in process efficiency, and the implementation of advanced wastewater treatment systems to address water pollution concerns. Backed by government grants, these initiatives have led to tangible results, such as reduced greenhouse gas emissions, increased recycling of industrial water, and decreased energy consumption per production unit, all of which contribute to cost savings and a strengthened sustainability profile (McKinsey & Company 2019).

<sup>1</sup>*Ijiwei* Network is a Chinese professional ICT (Information and Communications Technology) industry consulting service organization. It provides a range of services including industry consultation, brand marketing, intellectual property services, investment and financing, and career services, particularly within the electronic industry sector.

In 2022, SMIC alone received government subsidies accounting for 25% of the total 100 million yuan provided by the Chinese government to the semiconductor industry (Chao 2023). It was also the only foundry company to receive more than 100 million yuan in subsidies. During the same period, SMIC saw a 39% increase in revenue and a 13% rise in net profit. The case of SMIC serves as a microcosm of the broader Chinese semiconductor industry's trajectory towards sustainable development. It highlights how targeted state support, when combined with corporate commitment to sustainability and innovation, can drive both economic growth and environmental progress, positioning the industry to play a central role in China's long-term technological and ecological strategies.

In short, state support functions as a crucial reinforcement mechanism within China's semiconductor industry, ensuring that companies not only thrive in a capital-intensive and competitive sector but also align with national sustainability goals. Through financial incentives, regulatory frameworks, and direct involvement, the Chinese government has effectively integrated corporate strategies with state objectives, making sustainability a key component of growth. The collaboration between government policy and corporate strategy has empowered semiconductor firms to overcome the challenges of technological innovation while advancing China's broader economic and environmental objectives.

### Reputation And Stock Performance Enhancement

Government compliance and state support in China have driven two key outcomes: the enhancement of China's global reputation in achieving SDGs and the improvement of stock performance for companies. By aligning with state-led sustainability initiatives, firms not only contribute to national environmental goals but also see increased market value, demonstrating the dual benefits of government backing in both global standing and financial success. First, China's SDGs performance has seen notable progress in recent years. Between 2016 and 2023, China's ranking improved from 15th to 13th among G20 countries, and it currently ranks 63rd out of 166 countries globally. This progress highlights China's commitment to aligning its development strategies with the SDGs. However, back in 2017, China's SDG Index score was 67.1, with the country ranking 71st out of 157 UN member states. At that time, China faced significant challenges in delivering on many SDGs, with four SDGs receiving red ratings (SDG 3, 10, 13, and 14) and most others receiving brown ratings, indicating substantial areas for improvement (Wang et al. 2020).

The evaluation of China's SDG performance was initiated by Bertelsmann Stiftung and the Sustainable Development Solutions Network (SDSN) in 2016 when they began assessing the state of sustainable development across UN member states. The 2017 "SDG Index and Dashboards Report" highlighted China's challenges, particularly in health (SDG 3), reducing inequalities (SDG 10), climate action (SDG 13), and life below water (SDG 14), emphasizing the need for more targeted efforts. Based on the SDSN, China's SDGs Index Score is projected to steadily increase from 2018 to 2050 (Figure Two). Additionally, China, as the largest developing country, faces substantial regional imbalances in economic development and social welfare, further complicating its pursuit of SDG targets (Sachs et al. 2017). Despite these challenges, China's recent progress reflects an ongoing commitment to improving its sustainability and addressing these imbalances through focused policies and initiatives.

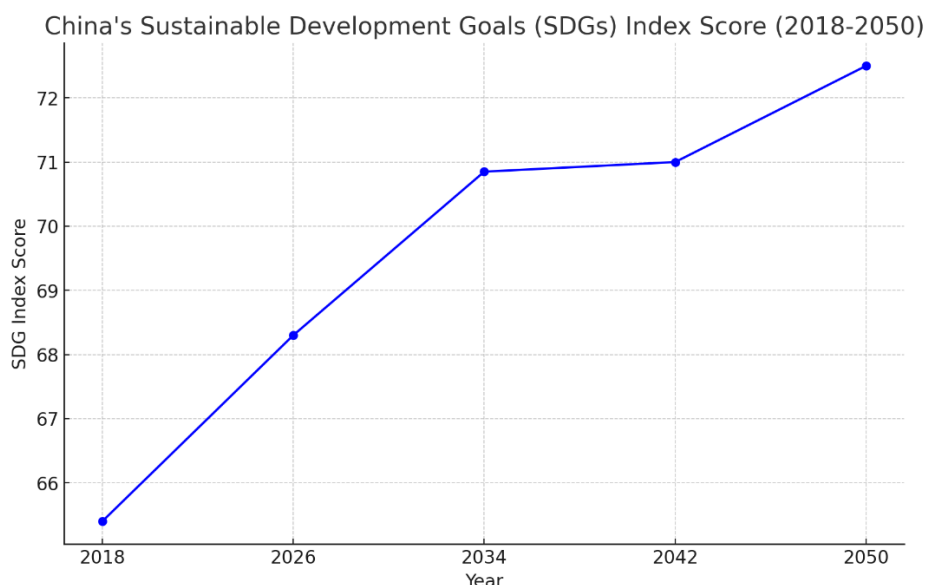


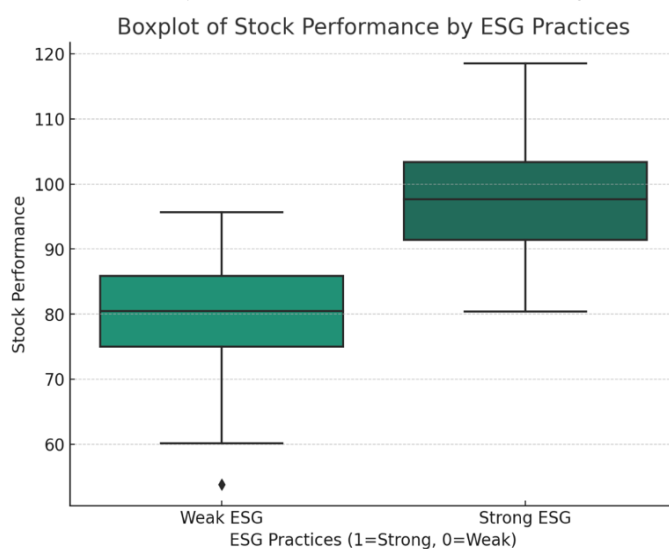
Figure Two: China's SDGs Index Score (2018-2050)

Second, companies that actively engage with SDGs and ESG reporting often see an improvement in their market values. Improved ESG performance can attract investors, positively impacting stock performance. Studies have shown a correlation between strong ESG practices and stock market performance in China (Yin et al. 2023). In the semiconductor industry, where future prospects are critically tied to technological innovation and sustainability, this can have a significant impact on a company's valuation (Lie et al. 2022). Moreover, a reputation for compliance and sustainability is an asset that opens doors to global markets and attracts quality partnerships. Engagement with SDGs is broadcast to stakeholders, signaling a commitment to responsible business practices. This commitment often translates into increased investor confidence, which can boost stock performance and provide a stable financial platform for future innovation (Li et al. 2023).

To understand the impact of China's semiconductor industry on economic growth and SDG alignment, I analyze the ESG reports of the top 100 Chinese semiconductor companies and their stocks performance. This analysis involves examining their R&D investment, production efficiency, employment generation, and contributions to environmental sustainability. This data provides insights into how these companies are integrating SDG principles into their business models and operations. Also, these reports provide a comprehensive view of each company's commitment to sustainability and social responsibility. The quantitative dataset includes two main variables for each company: the presence or absence of an ESG report (categorical variable) and the Stock Price-to-Earnings (P/E) Ratio (continuous variable).

The enriched dataset not only includes ESG reports from the top 100 semiconductor companies in China but also integrates governmental reports and industry analysis documents. The government reports provide insights into policy directions, subsidies, and compliance mandates that shape the operational context of these companies. Industry analysis reports, on the other hand, offer an external perspective on market trends, competitive dynamics, and the overall health of the semiconductor sector within the global and local markets. Together, this comprehensive dataset paints a detailed picture of the industry's drive towards sustainability, the role of government in steering corporate behavior, and the tangible outcomes of such interplay as reflected in the companies' financial and stock performance. This amalgamation of data sources is invaluable for understanding the full scope of factors influencing the adoption and reporting of ESG practices in China's semiconductor industry.

The analysis of the data aims to investigate the relationship between ESG reporting and financial



**Figure Three: Correlation between ESG Practices and Stock Performance**

performance as indicated by the P/E ratio. The underlying hypothesis is that companies that demonstrate a commitment to sustainable development goals (SDGs) through ESG reporting might be rewarded with higher market valuations, possibly due to investor confidence in their long-term prospects and risk management. Figure Three shows a simple linear regression was conducted, using the presence of an ESG report as the independent variable and the Stock P/E ratio as the dependent variable. This analysis was designed to determine if there was a statistical relationship between the publication of ESG reports and the companies' P/E ratios. To complement the regression analysis, a boxplot visualization was created to depict the distribution of Stock P/E Ratios for companies with and without ESG reports. This helped to illustrate the central tendency and spread of P/E ratios within these two categories.

The linear regression analysis aimed to evaluate whether the presence of an ESG report could predict the Stock P/E Ratio of companies. The model demonstrated a strong positive correlation between ESG practices and stock market performance, the boxplot visualization offers a different perspective from the earlier linear regression analysis. The result indicates a clear distinction in P/E ratios based on ESG practices. Companies with strong ESG practices show a higher median P/E ratio, suggesting that they are valued more favorably in the stock market. Additionally, the range of P/E ratios, as shown by the interquartile ranges, reveals that companies with strong ESG practices not only exhibit higher median P/E ratios but also a wider spread in their valuations. In this analysis, companies with strong ESG practices appear to have a competitive edge in the stock market, which may reflect investor confidence in their sustainable and ethical business operations. The dataset suggests that robust ESG practices might be correlated with higher stock valuations, challenging the earlier assertion that ESG reporting status does not significantly influence P/E ratios. The presence of an outlier in the weak ESG practices category indicates that there is at least one company in this category with an exceptionally low stock performance compared

to its peers. The lack of outliers in the strong ESG practice category suggests that companies with strong ESG practices have stock performances that are more consistent with each other.

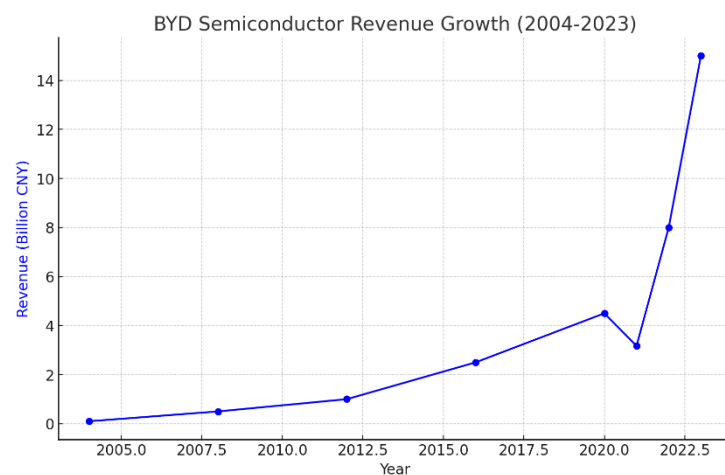
This boxplot analysis underscores the potential financial benefits of strong ESG practices, proposing that they could be a critical factor in a company's stock performance, in contrast to the initial regression findings. Investors might perceive strong ESG practices as indicative of forward-thinking management, better risk mitigation, and potentially better long-term prospects, which can lead to higher stock valuations. For investors, these findings would suggest that investing in companies with strong ESG practices might not only align with their ethical preferences but could also offer better financial returns. Companies may take these findings as an incentive to improve or highlight their ESG practices, as it may lead to improved stock market performance and investor relations.

In short, the in-depth exploration of China's semiconductor industry reveals a notable trend: active engagement with SDGs is not merely a compliance or ethical stance but a strategic business decision that significantly enhances both company reputation and stock performance. The combination of adhering to SDGs and receiving state support boosts the reputation of these companies. A strong reputation for sustainability can attract more investors, particularly those focusing on socially responsible investment (SRI) and ESG factors. This improved reputation helps companies to stand out in a competitive global market, attracting customers and partners who prioritize sustainability. The enhanced reputation for sustainability, underpinned by government support, translates into improved stock performance. Investors are increasingly recognizing that companies with strong ESG credentials are likely to be better long-term investments. They tend to have more robust risk management strategies, better compliance with regulations, and are often better prepared to adapt to changing environmental and societal expectations.

### Advancement in SDGs Achievement through Innovation

Quantitative data analysis shows a strong correlation between companies' engagement in SDGs practices and improvements in both their stock performance and global standing. However, as mentioned earlier, SDGs reporting does not always equate to actual performance in meeting these goals. Additionally, there is limited quantitative data available in China for deeper analysis. Therefore, in this section, I provide a concrete qualitative case study of BYD Semiconductor that highlights how companies implement SDGs through innovation, integration to diverse products, and leverage these efforts to gain market advantage. This growth has cascading effects, fostering related industries, creating employment opportunities, and propelling technological advancement across various sectors (Wishnick 2023).

BYD Semiconductor, founded in 2004 as a subsidiary of BYD Company Limited, exemplifies how aligning with SDGs can drive innovation in the semiconductor industry. With BYD holding a 72.3% stake, BYD Semiconductor specializes in the research, development, and manufacturing of power semiconductors, intelligent control ICs, intelligent sensors, and optoelectronic semiconductors. As a trailblazer in power semiconductors, BYD Semiconductor's strategic focus on innovation not only meets economic objectives but also contributes significantly to China's green technology initiatives, demonstrating how SDG alignment can foster both business growth and sustainability (BYD 2023 Sustainability Report).



**Figure Four: BYD Semiconductor Growth (2021-2023)**

According to reports from ION Analytics, BYD Semiconductor has demonstrated significant revenue growth from 2004 to 2023 (Figure Four). The company's steady rise in revenue, followed by a sharp increase after 2020, reflects its strategic alignment with both market demand for electric vehicle components and government-backed green technology initiatives. This surge in revenue, particularly from 2021 to 2023, highlights the company's expanding role in the semiconductor industry, driven by its focus on power semiconductors and innovation. The data underscores how BYD Semiconductor has positioned itself as a leading player in the global shift toward clean energy solutions, benefiting from both its technological advancements and favorable policy support.



Regarding SDGs, at the core of BYD Semiconductor's business model is the development of power semiconductors for energy-efficient applications. This focus on innovation has not only enhanced their product efficiency but also fueled economic growth by tapping into the burgeoning market for electric vehicles and renewable energy solutions. As noted in the industry analysis by Li (2015), BYD Semiconductor's commitment to R&D has led to increased manufacturing efficiencies, contributing to the broader economic ecosystem.

More specifically, BYD Semiconductor's advancements in power semiconductors directly contribute to SDG 9 by promoting industry and infrastructure innovation that leads to sustainable industrialization. Moreover, their products play a crucial role in achieving SDG 7 (Affordable and Clean Energy) by providing key components for renewable energy technologies and electric vehicles, as highlighted by the 2022 report from the International Renewable Energy Agency. In addition, the company's expansion and innovation have also supported SDG 8. According to Ke (2012), BYD Semiconductor's growth has created numerous high-skilled jobs, promoting sustained economic growth and decent work within China's high-tech sector.

The economic ripple effects of BYD Semiconductor's innovation-centric approach are significant, underpinning SDG 8 (Decent Work and Economic Growth). The company's growth trajectory, underscored by a commitment to creating high-value jobs within the high-tech sector, exemplifies how semiconductor companies can drive economic expansion while fostering a skilled workforce (Ke 2012). Despite global challenges such as supply chain disruptions and material shortages, BYD Semiconductor's strategic investment in next-generation materials like silicon carbide (SiC) illustrates a proactive approach to maintaining market competitiveness. This adaptation not only addresses immediate industry challenges but also sets a precedent for long-term resilience and sustainability in the face of shifting global market dynamics.

The case of BYD Semiconductor reaffirms the notion that sustainability and innovation are not mutually exclusive but are, in fact, mutually reinforcing. The company's journey underscores the significance of SDG-aligned innovation strategies for economic success and sustainable development within China's semiconductor industry.

Overall, innovation is at the heart of the semiconductor industry, and it is also a central theme in the achievement of SDGs. The semiconductor industry's innovations have direct and profound impacts on several SDGs. By investing in sustainable technologies and practices, companies can drive advancements that not only comply with government mandates but also contribute to global sustainability efforts. This symbiotic relationship between compliance, innovation, and sustainability creates a fertile ground for the industry to contribute meaningfully to SDGs, particularly in areas such as sustainable cities, responsible production, and climate action (Li et al. 2019). While SDG compliance might be a response to government policy, it also serves as a catalyst for innovation (Kuo, Kuo, and Chen 2022). Semiconductor companies in China recognize that integrating SDG principles can drive technological breakthroughs that lead to more efficient, high-performance products. Embracing sustainable practices often necessitates and inspires innovation, creating a positive feedback loop where SDG engagement enhances a company's capacity for technological advancement.

## Conclusion

From within China's semiconductor industry, the perspective on SDGs engagement is layered with strategic complexity, reflecting the intricate dynamics of state-business relations. This paper offers an introspective view of Chinese semiconductor companies' standpoint, exploring the multifaceted motivations behind SDGs compliance and the benefits that arise from aligning with government directives. By examining the intersection of policy influence and market dynamics, this study illustrates how government initiatives and corporate sustainability practices in China's semiconductor industry shape economic outcomes and drive progress towards global SDGs. It provides a unique lens to scrutinize the symbiotic relationship between state mandates, corporate responsibility, and financial performance, emphasizing the strategic importance of ESGs integration in high-tech industries in authoritarian regimes.

China's semiconductor industry's impressive trajectory can be largely attributed to its distinctive "whole-nation system" approach to industrial and technological policy. This system embodies several characteristics of an authoritarian government, including centralized decision-making, state-directed resource allocation, and a strong focus on national objectives. These features enable the seamless integration of goals such as technological self-sufficiency and sustainable development into the operational frameworks of the semiconductor sector. The result is an ecosystem primed for SDG-aligned innovation, where government mandates and corporate growth strategies are deliberately fused (Grimes and Du 2022). In this context, compliance with SDGs directives goes beyond regulatory adherence; it becomes a sophisticated strategy that leverages state support to advance corporate ambitions. This synergy enhances both reputation and stock performance, making SDGs alignment a strategic opportunity that fosters sustainable growth and global innovation.

Unlike in other authoritarian regimes, tech companies in China benefit significantly by aligning with government directives. The industry's proactive engagement with SDGs, driven by regulatory compliance, has delivered tangible gains in business performance and accelerated progress toward global sustainability goals. At the

same time, the government reaps substantial rewards and global standing from the rapid growth of these companies. The unique relationship between the state and business in China fosters a powerful dynamic where regulatory compliance grants companies access to government incentives, enhancing their reputations and boosting stock performance. In return, the government advances its SDG goals and strengthens its global reputation. This dynamic, supported by China's industrial and technological policies, has positioned the semiconductor sector as a key force in driving sustainable development and innovation.

However, this study has several limitations. One significant limitation is the reliance on ESG reports as a primary data source. While these reports offer valuable insights into companies' sustainability efforts, they may not always accurately reflect actual performance in achieving SDGs. The gap between reporting and real-world outcomes presents a challenge for assessing the true impact of corporate SDG engagement. Additionally, the focus on case studies of a few leading companies may not fully capture the diversity of experiences across China's entire semiconductor industry. Furthermore, this study centers on SDGs compliance in semiconductor development but does not address the considerable influence of technology and talent acquisition in China's rapid growth. Notably, the role of industrial espionage and illicit technology acquisition, though often unmentioned in official reports, has been suggested as a contributing factor to China's technological advancements. While these factors are beyond the scope of this study, acknowledging their potential impact is essential for a comprehensive understanding of the semiconductor industry's development in China.

For future studies, a broader approach is necessary to assess the real-world impact of SDGs alignment in the semiconductor sector. This could include independent audits, longitudinal studies, and data from a wider range of companies, including smaller firms and startups. Further research could also explore the long-term effects of state support on corporate innovation and sustainability, particularly in the face of global challenges such as supply chain disruptions and environmental crises. Exploring the impact of international partnerships, competition, and the influence of the United States, Japan, South Korea, and Taiwan on shaping China's semiconductor industry would further deepen the analysis.

The broader application of this study extends beyond China's semiconductor industry. The findings suggest that other sectors and countries could benefit from a similar model of state-driven support for SDGs alignment. Governments in developing and emerging economies, in particular, might look to China's approach as a way to leverage state-business synergies to drive both technological innovation and sustainability. However, different political and economic contexts will likely influence the feasibility and outcomes of such strategies. Balancing state involvement with corporate autonomy remains a critical challenge, and future research should examine how governance models impact the effectiveness of SDG-aligned growth across various industries and regions.

In summary, this paper has illuminated the intricate interplay between state policy and corporate action in China's semiconductor sector, highlighting how this relationship fosters sustainable development. Through the examination of companies' compliance with government-mandated SDGs, the study reveals a unique state-business dynamic characteristic of authoritarian yet state-capitalist China. While these relationships have led to significant advancements and rapid achievements in the short term, there remain questions and doubts about the sustainability and stability of this model in the long run. Despite these gains, China's SDG efforts and its semiconductor industry continue to face considerable challenges.

## References

- G. Allen (2023), *China's New Strategy for Waging the Microchip Tech War*, Center for Strategic and International Studies.
- T. V. Aken, O. Lewis (2015) *The Political Economy of Noncompliance in China: the case of industrial energy policy*, in "Journal of Contemporary China" 24:95, pp. 798-822.
- C. P. Bown (2020), *How the United States Marched the Semiconductor Industry into Its Trade War with China*, in "East Asian Economic Review", 24(4): 349-388.
- A. Chao (2023), *China gave 190 chip firms US\$1.75 billion in subsidies in 2022*, in "South China Morning Post".
- T. Chou, J. Chang, T. Li. (2014), *Government Support, FDI Clustering and Semiconductor Sustainability in China: Case Studies of Shanghai, Suzhou and Wuxi in the Yangtze Delta*, in "Sustainability", 6, 9.
- Chinese Academy of Science (2022), *Big Earth Data in Support of the Sustainable Development Goals*.
- X. Ding, J. Li (2015), *Incentives for Innovation in China: Building an Innovative Economy* (New York: Routledge Taylor & Francis Group).
- A. Ebrahimi (2023), *China Boosts Semiconductor Subsidies as US Tightens Restrictions*, in "The Diplomat".
- J. Goodrich (2024), *China's Evolving Semiconductor Strategy*, in "IGCC Blog", May 29.
- S. Grimes, D. Du (2022), *China's Emerging Role in the Global Semiconductor Value Chain*, in "Telecommunications Policy", 46, 2.
- C. Li et al. (2019), *Has the High-Tech Industry along the Belt and Road in China Achieved Green Growth with Technological Innovation Efficiency and Environmental Sustainability?* in "International Journal of Environmental Research and Public Health," 16, 17, 3117.
- R. Li et al. (2023), *Sustainability in Chinese Investment: How Chinese Investors Perceive the Benefit and Liabilities of ESG Rating of New Venture*, in "International Conference on Business and Policy Studies," pp. 99-114.
- Z. Li (2015), *Eco-innovation and Firm Growth: Leading Edge of China's Electric Vehicle Business*, in "International Journal of Automotive Technology and Management", 15, 3, pp.226-243.
- P. Lie et al. (2022), *ESG and financial performance: A qualitative comparative analysis in China's new energy companies*, in "Journal of Cleaner Production", 379, 1.
- International Renewable Energy Agency (2022), *The Role of Semiconductors in Renewable Energy Technologies*, pp. 1-52.
- R. Ke (2012), *Comparison of China and Japan's Economic Development in the Semiconductor Industry*, Bard College, Senior Projects Spring 2012.
- M. Klaus (2003), *Red Chips: Implications of the Semiconductor Industry's Relocation to China*, in "Asian Affairs: An American Review", 29:4, 237-253.
- A. Kratz, J. Oertel (2021), *Home Advantage: How China's Protected Market Threatens Europe's Economic Power*, in "European Council on Foreign Relations".
- T. Kuo, C. Kuo, L. Chen (2022), *Assessing Environmental Impacts of Nanoscale Semiconductor Manufacturing from the Life Cycle Assessment Perspective*, in "Resources, Conservation, and Recycling", 182, 3.
- Mckinsey & Company (2019), *China's Green Revolution*, pp. 1-140.
- J. J. Qi, P. Dauvergne (2022), *China's Rising Influence on Climate Governance: Forging a Path for the Global South*, in "Global Environmental Change", Volume 73, Article 102484.
- P. Triolo (2024), *A New Era for the Chinese Semiconductor Industry: Beijing Responds to Export Controls*, in "American Affairs", Spring, Volume VIII, No. 1.
- J. VerWey (2019), *Chinese Semiconductor Industrial Policy: Prospects for Future Success*, in "Journal of International Commerce and Economics", pp. 11-19.
- Y. Wang, Y. Lu, G. He, C. Wang, J. Yuan, X. Cao (2020), *Spatial Variability of Sustainable Development Goals in China: A Provincial Level Evaluation*, in "Environmental Development", Volume 35.
- E. Wishnick (2023), *China's Thirsty Chips*, in "Hinrich Foundation".
- Z. Yin et al. (2023), *China stock market liberalization and company ESG performance: The mediating effect of investor attention*, in "Economic Analysis and Policy", 80, pp.1396-1414.
- B. R. Young (2022), *Why Xi Jinping Has Lofty Visions of Green Mountains: China's Environmental Rhetoric is Rooted in Party History*, in "Foreign Policy", May 25.
- B. Zhang, J. Liu (2020), *The Role of Government in the Semiconductor Industry's Growth*, in "China Economics Journal", pp. 172-188.
- Q. Zhou (2023), *What are the Tax Incentives in China to Encourage Technology Innovation?* in "China Briefing".