The Development of AI on Taiwan's Economy and Electricity Demand

Ting-Wei Chao[1] , Yu-Ling Chang[2]

1.Department of Finance and Banking, Tamkang University 2.Department of Resources Engineering, National Cheng Kung University

Introduction

- According to the International Energy Agency (2025), **data centers** could account for up to **50% of the global increase** in electricity demand by 2030.
- AI is not just a digital tool but has also become **a key factor in the transformation of the energy structure.**
- With the rise of generative AI models (such as GPT and Bard) driving large-scale models and cloud services, the **energy demand of AI computing** has reached unprecedented levels.
- **Taiwan** is the world's **most important producer for semiconductor**; thus, the effects of AI investment on Taiwan's economy and energy demand is essential to the global economy.

Research question

Exploring the Potential Impact of AI Development on Taiwan's Industries and Energy Demand

Methodology

- Using input-output analysis

AI driven Investment Growth → Input-Output Analysis → Industrial growth → Surge in Electricity Demand → Impact on Carbon Emissions

◆ Industrial Classification

1. Agriculture, Forestry, Fishing, and Animal Husbandry	10. Cement Industry	19. Transportation Equipment	28. Educational Services
2. Natural Gas	11. Steel Industry	20. Computers, Electronics, and Optics	29. Healthcare Services
3. Coal	12. Semiconductor and Electronic Components	21. Other Manufacturing	30. Information Services
4. Other Mining	13. Other Electronic Components	22. Public Infrastructure and Construction	31. Financial Services
5. Textile, Garment, and Apparel Industry	14. Optoelectronic Materials	23. Water Supply and Pollution Control	32. Residential Services
6. Pulp, Paper, and Paper Products	15. Machinery and Equipment	24. Wholesale and Retail	33. Telecommunications
7. Petroleum Products	16. Food Manufacturing	25. Passenger, Freight, and Self-Operated Transportation	34. Other Professional and Technical Services
8. Basic Chemical Materials	17. Electricity and Steam	26. Accommodation and Food Services	35. Other Services
9. Chemical and Rubber Products	18. Power Generation, Transmission, and Distribution Machinery	27. Public Administration Services	

Results

- AI investment boosts **industrial growth**, **electricity demand**, and **CO_2 emissions**

1. Industrial impacts

High-Output Sectors

➤ **Semiconductors and Electronic Components**

A key sector in the AI hardware supply chain, producing core components such as AI chips, sensors, and memory. Its high spillover effect reflects that AI investment is heavily focused on hardware infrastructure, computing equipment, and chip development.

➤ **Other Professional and Technical Services**

Includes engineering consulting, R&D design, and technical advisory services that support the implementation of AI and the development of innovative technologies. It shows that AI investment not only affects physical products but also drives demand and growth in knowledge-intensive services.
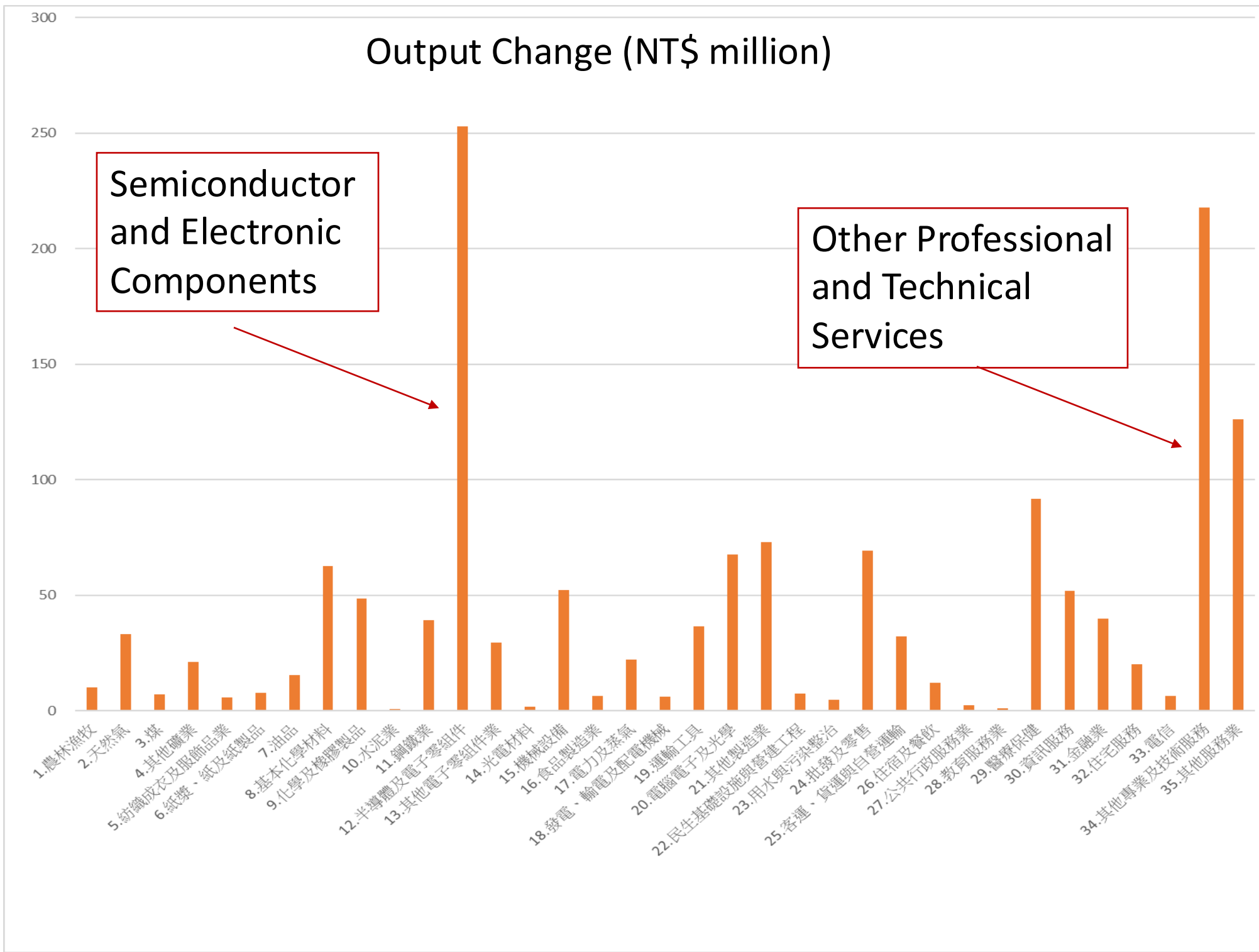

2. Electricity Demand

Highest - Semiconductor and Electronic Components
Due to the energy-intensive nature of wafer processing and cleanroom operations. With AI investments in chips and servers, production and power use have further increased.

Second - Other Professional and Technical Services
This sector covers cloud and AI facilities, which are power-intensive due to reliance on servers and cooling. AI training boosts demand, and data centers are expected to drive global electricity growth.
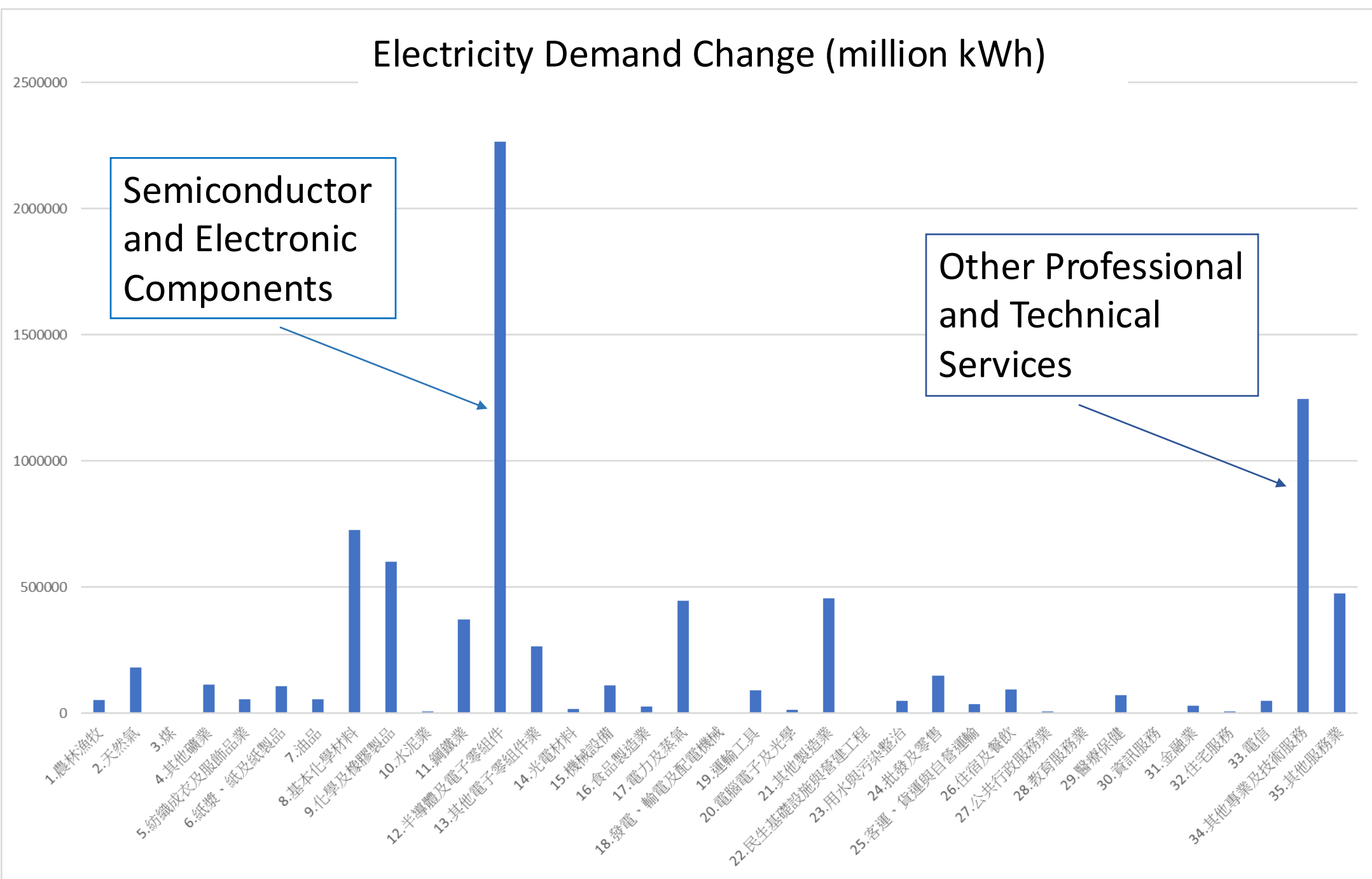
3. CO_2 emissions

➤ **Semiconductor-Related Emissions increase the Most**
Due to manufacturing processes that heavily rely on natural gas, electricity, and greenhouse gases, AI-driven growth in semiconductor production has directly led to increased energy use and carbon emissions.

➤ **Rising Emissions in Transport-Related Sectors**
AI use in logistics, computing, and automation raises fuel and electricity consumption, increasing emissions.

➤ **Stable Emissions in Knowledge-Intensive Services**
AI mainly drives digital and workforce transformation in these sectors, with minimal impact on physical energy use and emissions.
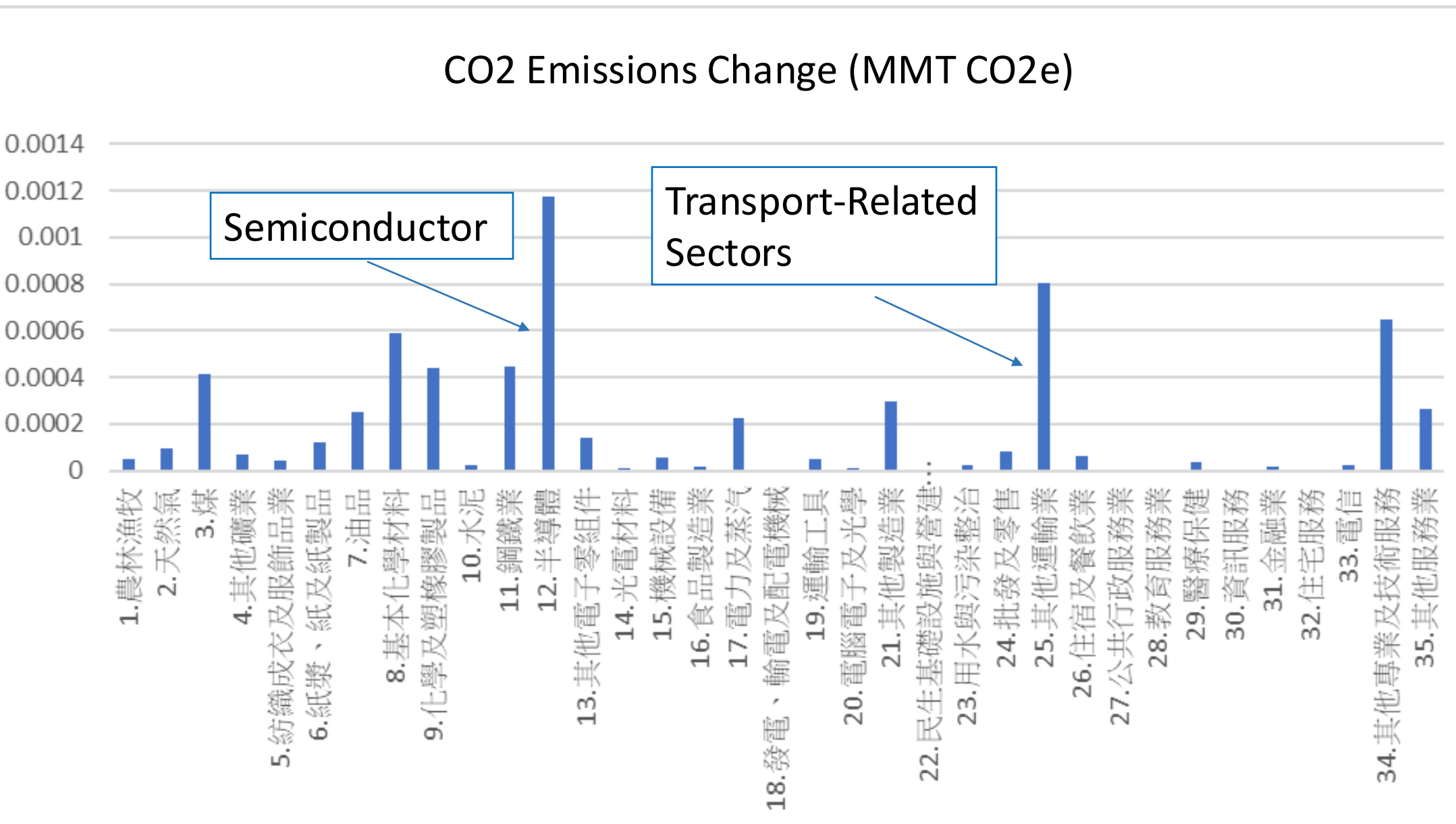
Conclusions and policy implications

- While AI investment positively contributes to overall economic growth, it may also **increase carbon emission pressure** in energy-intensive industries such as semiconductors. Therefore, future AI development should be accompanied by efforts to **optimize the energy structure** and **enhance energy efficiency.**
- In the future, energy **demand-side management** should be expanded by promoting energy efficiency standards for AI servers and equipment, along with providing related energy-saving subsidies.
- **Early planning for power supply development** is essential to meet the anticipated growth in electricity demand.