

摘要

全球半導體產業快速的發展下，衍生而出的環境問題也不容忽視。由於工商業過度發展使得生態破壞、廢棄物汙染、能源供應短缺等因過度發展而影響了全球存續。因此，實現環境永續發展已經成為企業經營中的一項至關重要的工作。傳統企業績效評估研究經常採用財務指標，而忽略環境相關指標。事實上，環境指標攸關企業永續發展，若能適時將其加入衡量，便能有效研析企業永續營運績效。因此，本研究不僅延續傳統財務指標的採用，亦蒐集各公司各年度盤查之用電、水及溫室氣體排放量；其中，財務指標攝取自台灣經濟新報(Taiwan Economic Journal)，環境指標攝取自各公司發行之企業社會責任報告書。

本研究以動態 SBM 模型作為效率工具，針對國內半導體產業，建立發展考量環境層面指標的績效模式架構，並以其探討我國 32 間上市半導體公司在 2018 年至 2022 年的營運績效變遷。該環境模式採用「員工人數」、「營業費用」、「用水量」和「用電量」作為投入項，「營業收入」和「普通股市值」則作為產出項，跨期變數為「不動產廠房及設備資產」、「二氧化碳排放量」。比較本環境與傳統評估架構的差異結果顯示在環境模式中，半導體上游 IC 設計業的績效表現明顯較傳統模式佳，然而在中游 IC 製造業和下游 IC 封測業的績效表現明顯較傳統模式差。此外，環境模式中整體效率較佳的標竿上游企業為創意、凌陽、瑞昱、義隆、松翰和盛群；中游企業為京鼎；下游企業為順德。因上游 IC 設計產業在水、電的投入相較於中游 IC 製造和下游 IC 封測產業不需如此大量，且 IC 製造階段通常也會產生大量的廢水和廢氣，在廢物處理、化學品使用和環境控制等方面需求較多，因此 IC 中游產業所受到的影響較大且表現較差。期盼本研究結果能提供半導體產業上、中、下游產業鏈在永續發展中改善建議。

關鍵詞：半導體產業、資料包絡分析法、環境永續、動態 SBM

Abstract

A rapid development of the global semiconductor industry inevitably results in environmental problems. Global survival is at risk due to the excessive growth of industry and commerce, ecological destruction, waste pollution, energy shortages, and other effects of overdevelopment. Therefore, ensuring environmental sustainability has become a significant part of business operations. Enterprise performance evaluations often use financial indicators, but ignore environmental ones. When environmental indicators can be included in the measurement in a timely manner, enterprises' sustainable operation performance can be effectively analyzed.

Consequently, in addition to traditional financial indicators, this study also collected electricity, water, and greenhouse gas emissions from each enterprise. Financial indicators were taken from the Taiwan Economic Journal, and environmental indicators were taken from corporate social responsibility reports.

Using the dynamic SBM model, this study includes two frameworks, namely, the environmental framework and the traditional framework, for evaluating semiconductor industry performance. These frameworks were used to examine the changes in operational performance of 32 listed semiconductor enterprises in Taiwan over the period 2018 to 2022.

The comparison of the environment and the traditional evaluation framework shows that the performance of the upstream enterprises(e.g., GUC, Sunplus, Realtek, ELAN, Sonix, Holtek) are better in the environment framework. However, only a few enterprises in the midstream(e.g., Fiti) and downstream(e.g., SDI) have better performance.

Keywords: Semiconductor industry, Data envelopment analysis, Environmental sustainability, Dynamic SBM