

Nonlinear effects of ESG on energy-adjusted firm efficiency: Evidence from the stakeholder engagement of apple incorporated

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ABSTRACT

This study examines how the (i) overall environmental, social, and governance (OESG) performance; (ii) three individual E, S, and G (IESG) performance; and (iii) subcomponents of the three individual E, S, and G (SIESG) performance affect 29 Apple Incorporation partners' energy-adjusted firm efficiency from a nonlinear perspective. Our truncated regression findings from 145 firm-year observations for the period of 2016–2020 indicate that the association between OESG performance and energy-adjusted firm efficiency is U-shaped. However, this nonlinear U-shape exists in the individual S and G but not E of the IESG performance. Moreover, only certain subcomponents of the SIESG performance are nonlinearly related to energy-adjusted firm efficiency. Overall, we highlight both the costs and benefits of the ESG performance for maintaining sustainable development and stakeholder engagement. The energy-adjusted firm efficiency estimated through the multidimensional data envelopment analysis approach is also noteworthy for policy and decision-making purposes.

KEYWORDS

Apple incorporated; Data envelopment analysis; Energy-adjusted firm efficiency; ESG; Stakeholder engagement; Sustainable development

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