

# The cubic S-curve relationship between board independence and intellectual capital efficiency: does firm size matter?

Board  
independence  
and intellectual  
capital efficiency

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## Abstract

**Purpose** – First, this study assesses firms' efficiency of transforming intellectual capital (IC) components into firm performance. Second, this study examines (1) cubic S-curve relationship between board independence and IC efficiency and (2) how firm size moderates the cubic S-curve relationship.

**Design/methodology/approach** – This study employs a stochastic nonparametric envelopment of data (StoNED) framework to estimate IC efficiency, which is derived from the estimation process of transforming structural, relational and human capitals into accounting- and market-based performance indicators. This study conducts regression analyses on 1,104 firm-year observations of Taiwanese semiconductor firms over the period of 2011–2018.

**Findings** – StoNED results suggest that sample firms' IC efficiency can be relatively improved by approximately 80%. Regression results indicate that a cubic S-curve relationship between board independence and IC efficiency exists, and firm size moderates the nonlinear effects.

**Practical implications** – Overall, this study highlights the importance of examining the nonlinear effect of board independence on IC efficiency from the perspective of agency theory, and the moderating effect from firm size, which may suggest availability of resources from the resource-based view of the firm.

**Originality/value** – This study contributes to the literature through the innovative application of an efficiency-based tool for evaluating IC efficiency. The cubic S-curve relationship between board independence and IC efficiency also points to the policy concerning the appropriate number of independent directors on board.

**Keywords** Intellectual capital efficiency, Board independence, Firm size, StoNED, Cubic S-Curve

**Paper type** Research paper

## 1. Introduction

Increasing competition and the recent dynamics in modern fast-moving knowledge-based economies have essentially transformed the corporate environment involving not only tangible resources but also intangible assets. The efficient management of the latter, which may be regarded as intellectual capital (IC), is important because it generates value for corporate profits and, ultimately, shareholders' wealth. The literature documents that the

