

Complementarity and Substitutability between Tangible and Intangible Capital:  
Evidence from Japanese Firm-level Data\*

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Abstract

Using Japanese firm-level panel data spanning from 2000 to 2013, we estimate industry-level production functions that explicitly take into account the substitutability and complementarity between tangible and intangible capital. The estimation results show substantial heterogeneity among industries in terms of substitutability and complementarity between tangible and intangible capital. We further find that the relation between tangible and intangible capital in the production function accounts for their relations in investments. These findings show the necessity to take into account the relation between the dynamics of tangible and intangible capital for precisely understanding the mechanisms governing a firm's growth.

Keywords: Intangible capital, Production function, Complementarity and substitutability, Investment.  
JEL classification: D24, E22.

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