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PERM

Intellectual Capital Investments: Evidence from Panel VAR Analysis

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Intellectual capital (IC)

- **Intellectual capital (IC)**
  - Human capital (HC)
  - Structural capital (SC)
  - Relational capital (RC)

(Bontis, 1996, 1998, 1999; Bontis, Chua, & Richardson, 2000; Stewart, 1991, 1997; Nazari, 2010)

Literature review. Theory

1. IC components helps company to gain competitive advantage and **contribute to performance** (Chang and Hiesh, 2011; Huang and Wu, 2010; Carbita et al., 2006; Kamukama et al., 2010; Bontis et al., 2000; Tseng and Goo, 2005; Dı´ez et al., 2010)
2. IC components are **interrelated** (Chang and Hiesh, 2011; Huang and Wu, 2010; Carbita et al., 2006; Kamukama et al., 2010; Bontis et al., 2000; Tseng and Goo, 2005)
3. possible **delay between the impacts** of one intellectual component on performance or others components (Tseng and Goo, 2005; Kaplan and Norton,1992; Chen et al., 2004).

4. + **earnings** are the determinant of investments (Love and Zicchino, 2006; Eklund, 2010)

Literature review. Empirical research

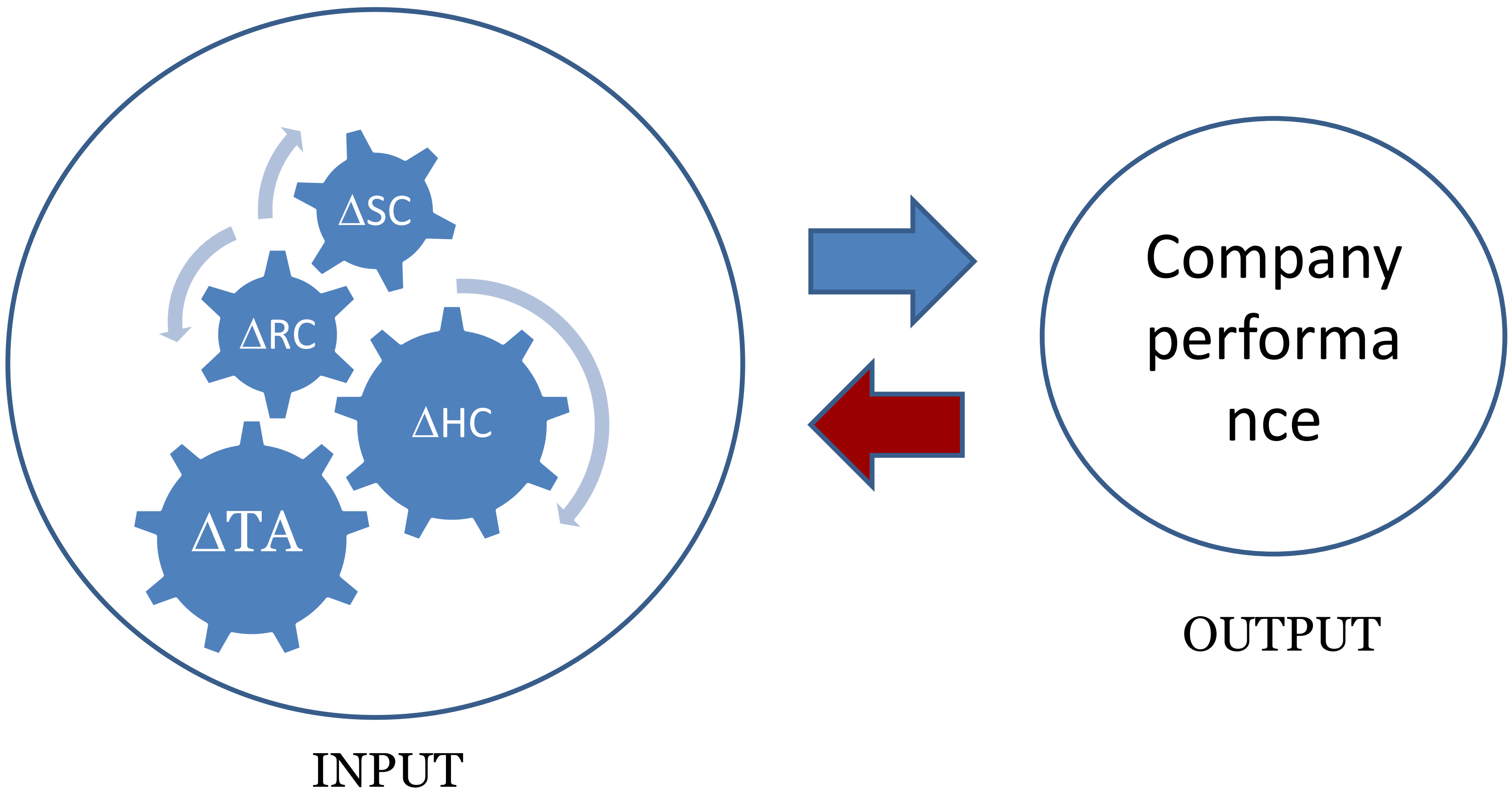
1. Influence of intellectual capital components on company performance – **mixed results** (Bontis et al., 2000; Carbita et al., 2006).
2. IC components are **interrelated** (Chang and Hiesh, 2011; Huang and Wu, 2010; Carbita et al., 2006; Kamukama et al., 2010; Bontis et al., 2000; Tseng and Goo, 2005).
3. Models with delay by **1 or 2 periods** had been tested – **confirmed** (Tseng and Goo, 2005).

4. earnings are the determinant of investments in IC – **no research**

Purpose

The aim of this study is to analyze a **dynamic relationship between IC components and economic profit**, with a special emphasis on industry specific effects in pharmaceutical, retail, steel, telecommunications, and service sectors.

Relationship between IC components and economic profit



Methodology. IC proxy indicators

Human capital (HC)	• Number of employees (Scandia Navigator, 1997; Гаранина, 2009; Sullivan, 2000; Wang, Chang, 2005; Zickgraf, Merton et al., 2007)
Structural capital (SC)	• Intangible assets (Shakina, 2011; Shakina, Barajas Alonso, 2012)
Relational capital (RC)	• Excess of accounts receivable over accounts payable

Methodology. Company performance measurement

NOPAT

- one of the traditional performance measures
- could be derived directly from a company's reports

EVA

- Reflects company value creation
- Available for unlisted companies

Data

- Compustat database
- American companies
- pharmaceutical, retail, steel, telecommunications, and service industries
- for 2001 to 2010

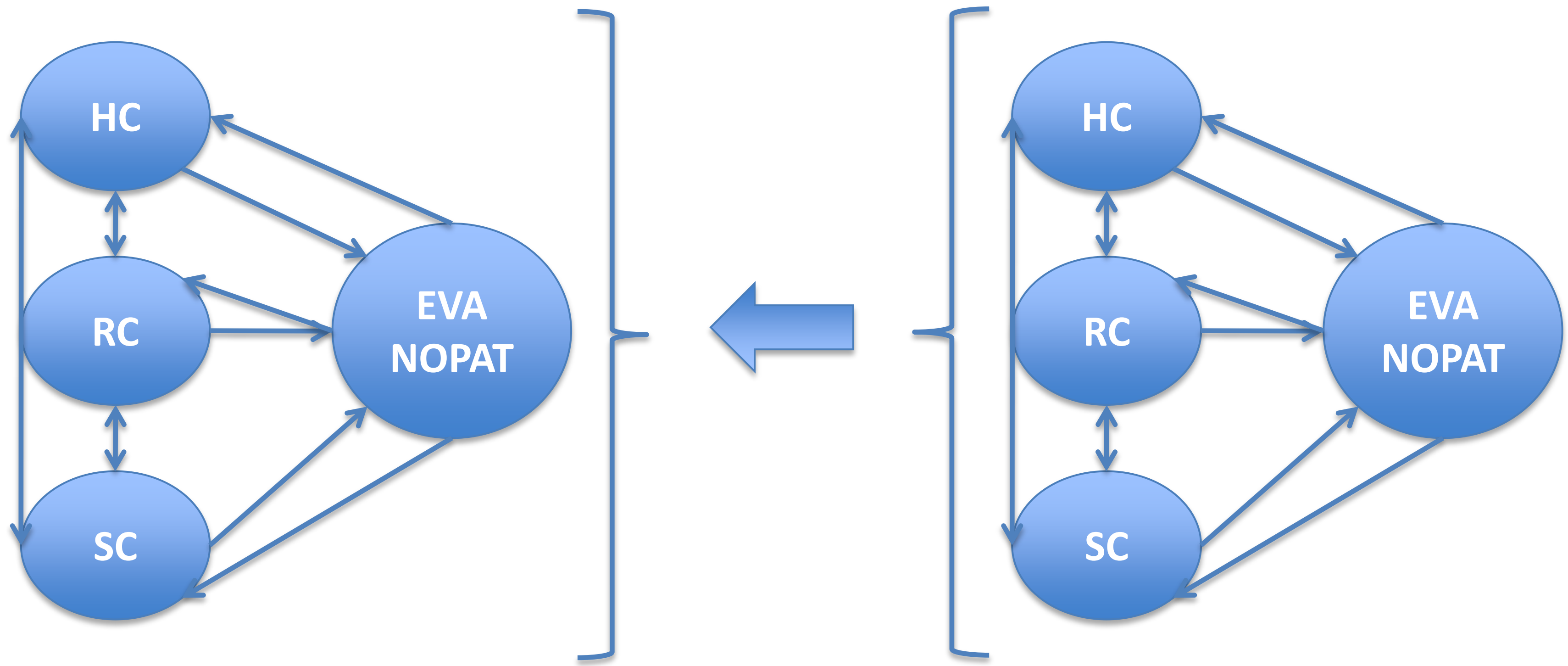
Data

	N	HC/TA	SC/TA	RC/TA
Pharmaceutical	1035	0.09	10.47	-7.20
Retail	1080	0.06	1.82	-1.68
Services	1222	0.36	6.82	-6.85
Steel industry	390	0.02	0.28	-0.50
Telecommunications	1727	0.04	3.33	-1.19

A comparison of industries on the relative size of intellectual capital component

Methodology

- panel vector auto regression (pVAR)



Lag 1

Methodology

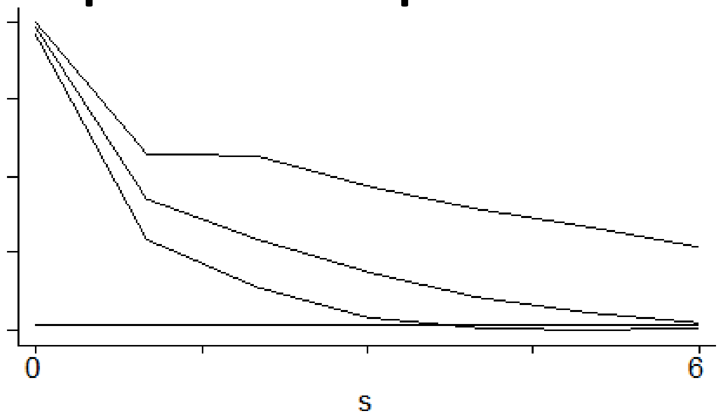
- PVAR of a second order

$$z_{i,t} = \alpha + \beta_1 \cdot z_{i,t-1} + \beta_2 \cdot z_{i,t-2} + f_i + e_{it}$$

- ***Zit*** is a vector of {NOPAT (or EVA), hc, rc, sc, control variables}
- ***fi*** is a company's individual features
- **hc** is the increase in the number of employees
- **rc** is the increase of the difference between accounts receivable and accounts payable
- **sc** is the increase in the value of intangible assets
- **NOPAT** is the net operating profit
- **EVA**

Methodology

- impulse-response function (IRF)



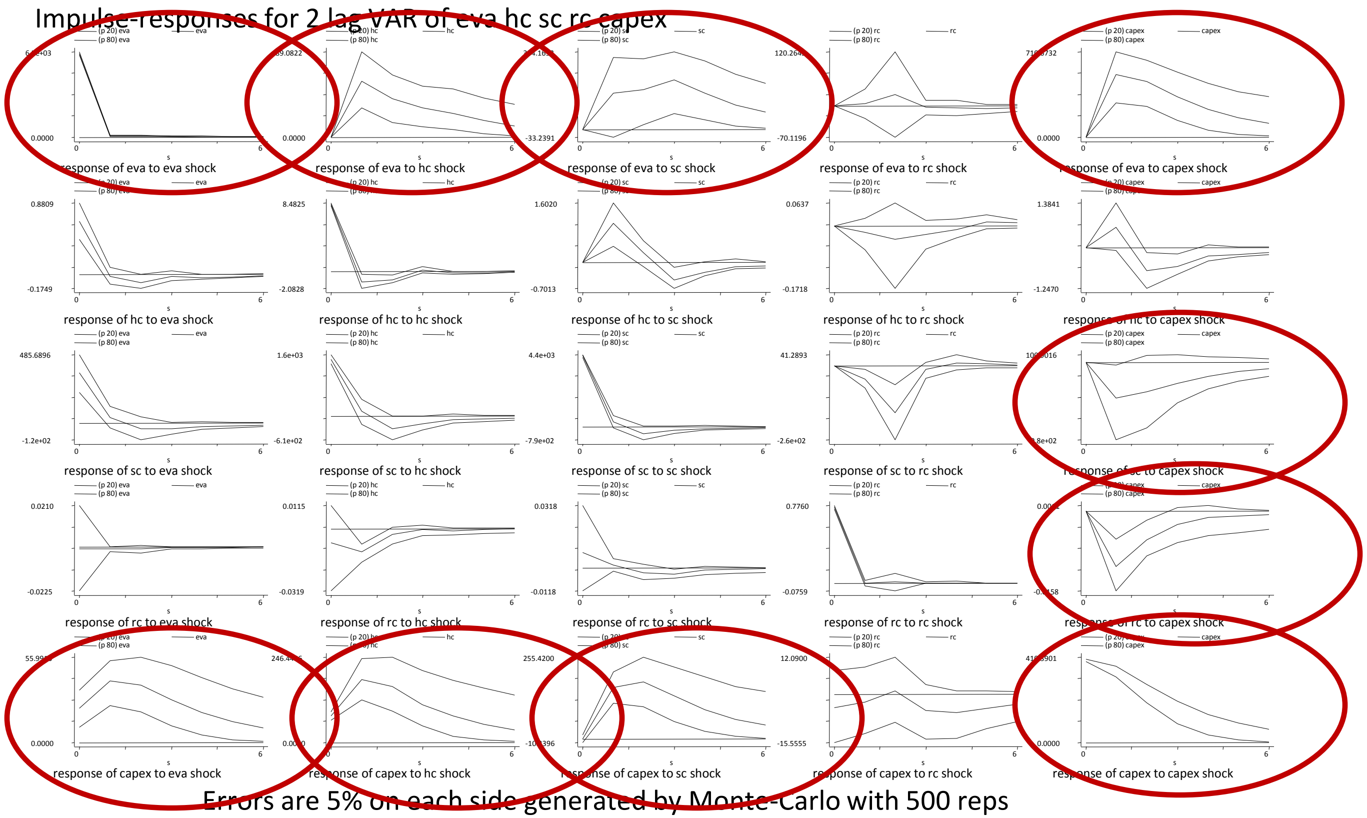
Response of EVA to HC shock

- orthogonal IRF (Choleski decomposition)

  it permits to focus on how a shocked variable (e.g. human capital) impacts another variable (e.g. EVA) keeping other shocks (e.g. capital expenditures, structural and relational capital and their lags) constant

- fixed effects, Helmert procedure
- GMM, but GMM = 2SLS (in this case)
- bootstrap confidence intervals

An example of IRFs



IFRs for telecommunications

Results

- **Pharmaceuticals** – investments in HC and tangible resources gain a positive return after a five years and more
- **Retail**, SC doesn’t matter for NOPAT and decreases EVA
- **Telecommunications**, HC(-1) and SC(-2) contribute to the creation of EVA. In this case, the most important roles are played by investments in human capital of the previous year, and, as for structural capital, investments from the two previous years
- In the **steel** industry, investments in HC(!) play the most significant role
- Value creation in companies providing **consulting and educational services** is a less definite process
- **Performance** influence on IC investments in services, steel and retail
- Interdependence of **IC components** exists in retain, steel and telecom industries

Conclusions

1. Investments in IC can give a positive return over the course of six years.
2. Return on intellectual capital is frequently close to zero or even is negative for a long period.
3. Management generally takes into consideration company performance when making investment decisions on capital expenditures, but not always when deal with intellectual capital.
4. Significant difference between the influence of investments on operating profit and on economic profit.
5. Influence of capital expenditures on EVA is significant.
6. Mutual dependence of IC components and performance.
7. Models of intellectual capital outputs should be dynamic.