

The Impact of Intangible Investment on the Relative Importance of Firm- Specific Factors versus Market- and Industry-Level Factors in the Determination of Firm Level Earnings

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Research Question

Does intangible investment affect the degree to which an individual firm's earnings performance shares commonalities with the market and/or its industry?

Earnings Non-commonality

Earnings Noncommonality is the unexplained portion (i.e. $1 - R^2$) from firm-specific regressions of quarterly ROA on market- and industry-level ROA indices.

Why study earnings non-commonality?

- It determines the relative weights to place on market-level, industry-level, and firm-specific information in the conduct of fundamental analysis
 - e.g. it influences how analysts structure their activities and their ultimate success in forecasting (e.g. Kini et al. [2009]; DeFranco et al. [2008])
- Yet, there is little evidence on its underlying determinants.

Why relate intangible investment to earnings noncommonality?

- Their theoretical properties are likely to be relevant to the extent of economic differentiation.
- Resource-based view posits that intangible investments are hard for others to replicate and, therefore, allows the firm to be “unique in its industry along some dimension that is highly valued by customers” (Palepu, Healy and Bernard [2007])
 - Implies that intangible investment leads to heterogeneity in economic performance.

Why relate intangible investment to earnings noncommonality?

Industrial organization view argues that intangible resources behave like public goods due to their non-rival and non-excludable nature and, hence, may engender commonalities in economic performance.

- Non-rival (multiple users can benefit from an intangible resource simultaneously)
- Partial excludability (limited ability to prevent others from benefitting from knowledge embedded in intangible resources)
- Subject to natural forces of diffusion through, for example, employee mobility, human interactions and competitive intelligence

Earnings Noncommonality

- The unexplained portion (i.e. $1 - R^2$) from the following firm-specific regressions estimated over the current and 19 prior quarters.

$$ROA_{i,t} = \alpha_0 + \alpha_1 MKTROA_{i,t} + \alpha_2 INDROA_{i,t} + \varepsilon_{i,t}$$

$$NONCOMMON_{i,t} = \log \left(\frac{UNEXPLAINED_{i,t}}{1 - UNEXPLAINED_{i,t}} \right)$$

- Numerator of ROA measures are adjusted for quarterly R&D expense
- Denominator of ROA measures are adjusted for the implicit amount of R&D capital as of the beginning of the quarter.

Intangible Intensity Measures

$$INTANGIBLEINTENSITY_{i,t} = \frac{\sum_{q=-19}^0 \left(\frac{INTANGIBLES_{i,t+q}}{ASSETS_{i,t+q} + RDCAPITAL_{i,t+q}} \right)}{N}$$

Intangible Intensity Measures (cont'd)

- Market-to-book ratio captures implied market valuation of intangible resources not accorded accounting recognition

Research Question 1

- Do intangible investments affect the degree of non-commonality in firms' earnings performance?

Regression Model – RQ1

$$\begin{aligned}NONCOMMON_{i,t} = & \beta_0 + \beta_1 \log(INTANGIBLEINTENSITY_{i,t}) + \beta_2 \log(MB_{i,t}) + \\ & \beta_3 \log(MVE_{i,t}) + \beta_4 MKTSHARE_{i,t} + \beta_5 STDROA_{i,t} + \beta_6 \log(DIVERS_{i,t}) + \\ & \beta_7 \log(HERF_{i,t}) + \beta_8 \log(LEVERAGE_{i,t}) + \beta_9 REG_{i,t} + \\ & \beta_{10} \log(NIND_{i,t}) + \varepsilon_{i,t}\end{aligned}$$

Model Specification

- We mitigate effects of serial correlation due to overlapping rolling windows by:
 - Retaining only the fourth calendar quarter of each firm-year
 - Reporting t-statistics based on two-way clustering of standard errors by firm and calendar year.

Sample Selection

- Sample period 1980 – 2006
- Firms on COMPUSTAT with non-missing information for regression variables
- Final sample for RQ1 consists of 119,436 firm-quarter observations.

Table 4 – Test of RQ1

DEPENDENT VARIABLE: <i>NONCOMMON</i>			
Variable	<u>Coefficient</u> <u>Estimate</u>	<u>t-statistic</u>	<u>p-value</u>
<i>Intercept</i>	2.000	17.91	<0.001
<i>log(1+INTANGIBLEINTENSITY)</i>	0.402	4.18	<0.001
<i>log(MB)</i>	0.052	4.82	<0.001
<i>log(MVE)</i>	-0.092	-12.77	<0.001
<i>MKTSHARE</i>	0.266	1.17	0.250
<i>STDROA</i>	0.006	1.94	0.064
<i>log(1+DIVERS)</i>	-0.161	-1.89	0.071
<i>log(1+HERF)</i>	-0.270	-1.45	0.159
<i>log(1+LEVERAGE)</i>	0.013	1.48	0.150
<i>REG</i>	0.263	4.11	<0.001
<i>log(NIND)</i>	0.003	0.16	0.872
Adjusted R ²	1.46%		
Number of Observations	119,436		

Research Question 2

- Do the various classes of recognized and unrecognized intangible investments differentially affect the degree of non-commonality in firms' earnings performance?

Different Characteristics of Various Classes of Intangibles

- Separable recognized intangibles (e.g. patent costs, copyrights, licenses, contract rights, trademarks, and trade names)
 - Arise from contractual rights or are separable from the firm
 - May be relatively less susceptible to expropriation
- Goodwill
 - Captures unique synergies associated with business combinations
 - Captures the synergistic combination of acquired businesses' assets
 - Captures the ability to earn monopoly profits and impose market barriers
 - External firms are likely to find these benefits hard to exploit

Different Characteristics of Various Classes of Intangibles

3. Research and Development

- Past research documents substantial spillovers of R&D wherein:

“The innovating firm provides a positive externality to other market participants in that due to the public good nature of information (and assuming zero transaction costs), its research will become available to others at little or no extra cost, enabling them to free ride on its benefits (p. 328).”

- Suggests that R&D may behave more like a public good and, hence, may engender relatively greater commonalities in economic performance.

Decomposition of Intangible Intensity

$$INTANGIBLEINTENSITY_{i,t} = \frac{\sum_{q=-19}^0 \left(\frac{INTANGIBLES_{i,t+q}}{ASSETS_{i,t+q} + RDCAPITAL_{i,t+q}} \right)}{N}$$

$$SEPARABLEINTENSITY_{i,t} = \frac{\sum_{q=-19}^0 \left(\frac{SEPARABLE_{i,t+q}}{ASSETS_{i,t+q} + RDCAPITAL_{i,t+q}} \right)}{N}$$

$$GOODWILLINTENSITY_{i,t} = \frac{\sum_{q=-19}^0 \left(\frac{GOODWILL_{i,t+q}}{ASSETS_{i,t+q} + RDCAPITAL_{i,t+q}} \right)}{N}$$

$$RDINTENSITY_{i,t} = \frac{\sum_{q=-19}^0 \left(\frac{RDCAPITAL_{i,t+q}}{ASSETS_{i,t+q} + RDCAPITAL_{i,t+q}} \right)}{N}$$

Regression Model – RQ2

$$\begin{aligned} \text{NONCOMMON}_{i,t} = & \delta_0 + \delta_1 \log(\text{SEPARABLEINTENSITY}) + \delta_2 \log(\text{GOODWILLINTENSITY}_{i,t}) + \\ & \delta_3 \log(\text{RDINTENSITY}_{i,t}) + \delta_4 \log(\text{MB}_{i,t}) + \delta_5 \log(\text{MVE}_{i,t}) + \delta_6 \text{MKTSHARE}_{i,t} + \delta_7 \text{STDROA}_{i,t} + \\ & \delta_8 \log(\text{DIVERS}_{i,t}) + \delta_9 \log(\text{HERF}_{i,t}) + \delta_{10} \log(\text{LEVERAGE}) + \delta_{11} \text{REG}_{i,t} + \delta_{12} \log(\text{NIND}_{i,t}) + \varepsilon \end{aligned}$$

Table 4 – Test of RQ2

DEPENDENT VARIABLE: <i>NONCOMMON</i>			
<u>Variable</u>	<u>Coefficient Estimate</u>	<u>t-statistic</u>	<u>p-value</u>
<i>Intercept</i>	1.988	16.73	<0.001
<i>log(1+SEPARABLEINTENSITY)</i>	0.803	3.87	0.001
<i>log(1+GOODWILLINTENSITY)</i>	0.325	2.17	0.040
<i>log(1+RDINTENSITY)</i>	0.309	2.82	0.009
<i>log(MB)</i>	0.053	4.93	<0.001
<i>log(MVE)</i>	-0.092	-12.73	<0.001
<i>MKTSHARE</i>	0.295	1.292	0.208
<i>STDROA</i>	0.006	1.924	0.066
<i>log(1+DIVERS)</i>	-0.163	-1.844	0.077
<i>log(1+HERF)</i>	-0.266	-1.433	0.164
<i>log(1+LEVERAGE)</i>	0.010	1.148	0.262
<i>REG</i>	0.262	4.091	<0.001
<i>log(NIND)</i>	0.006	0.343	0.735
Adjusted R ²	1.48%		
Number of Observations	119,436		

Research Question 3

3. Does the strength of legal property rights protection affect the relation between intangible investment and the degree of non-commonality in firms' earnings performance?

Impact of Appropriability Conditions on the behavior of intangibles

- Degree to which intangibles behave like public goods depends on both:
 - Their underlying economic properties
 - The property rights regime that surrounds them.
- Patents, copyrights and other legal mechanisms are designed to provide property rights protection over original ideas.
 - If these mechanisms are effective then intangibles that reflect these ideas should behave less like public goods
- Not clear how effective these mechanisms are given abundance of patent lawsuits.

Regression Model – RQ3

$$\begin{aligned}NONCOMMON_{i,t} = & \gamma_0 + \gamma_1 \log(SEPARABLEINTENSITY_{i,t}) + \\ & \gamma_2 \log(GOODWILLINTENSITY_{i,t}) + \gamma_3 \log(RDINTENSITY_{i,t}) + \gamma_4 \log(MB_{i,t}) + \\ & \gamma_5 LEGALRIGHTS_{i,t} + \gamma_6 \left[\log(RDINTENSITY_{i,t}) \times LEGALRIGHTS_{i,t} \right] + \\ & \gamma_7 \log(MVE_{i,t}) + \gamma_8 MKTSHARE_{i,t} + \gamma_9 STDROA_{i,t} + \gamma_{10} \log(DIVERS_{i,t}) + \\ & \gamma_{11} \log(HERF_{i,t}) + \gamma_{12} \log(LEVERAGE) + \gamma_{13} \log(NIND_{i,t}) + \varepsilon_{i,t}\end{aligned}$$

Measurement of Legal Rights

- Based on the 1994 Carnegie Mellon Survey on Industrial R&D in the US Manufacturing sector.
- R&D managers rate the effectiveness of alternative mechanisms for protecting product and process innovations over 1991-1993.
- Our legal rights measure combines R&D managers' ratings of the effectiveness of patents and other legal protections.
- LEGALRIGHTS =1 if firm operates in industry where strength of legal rights protections is above the sample median.

Table 5 – Test of RQ3

<u>Variable</u>	<u>Coefficient Estimate</u>	<u>t-statistic</u>	<u>p-value</u>
<i>Intercept</i>	2.031	10.433	<0.001
<i>log(1+SEPARABLEINTENSITY)</i>	0.840	2.523	0.018
<i>log(1+GOODWILLINTENSITY)</i>	0.546	2.170	0.040
<i>log(1+RDINTENSITY)</i>	0.284	1.641	0.113
<i>log(1+RDINTENSITY) × LEGALRIGHTS</i>	0.493	2.317	0.029
<i>LEGALRIGHTS</i>	-0.137	-3.823	0.001
<i>log(MB)</i>	0.038	2.676	0.013
<i>log(MVE)</i>	-0.093	-9.400	<0.001
<i>MKTSHARE</i>	0.306	0.339	0.737
<i>STDROA</i>	0.010	2.116	0.045
<i>log(1+DIVERS)</i>	-0.167	-1.390	0.177
<i>log(1+HERF)</i>	-0.687	-1.066	0.296
<i>log(1+LEVERAGE)</i>	-0.010	-0.770	0.449
<i>log(NIND)</i>	0.016	0.557	0.583
Adjusted R ²	2.20%		
Number of Observations	51,401		

Earnings Non-commonality vs. Stock Return Non-commonality

- Stock return non-commonality reflects commonalities in underlying economic performance but also factors related to the firms information and trading environment such as:
 - Information transparency (Li and Myers [2006])
 - Voluntary disclosure practices (Haggard, Martin, and Pereira [2008])
 - Financial contagion (Kyle and Xiong [2001])
 - Investor sentiment (Barberis, Shleifer, and Wurgler [2005])
 - Style investing (Barberis and Shleifer [2003])
 - Trading activities of analysts, insiders and institutional investors (Piotroski and Roulstone [2004])
- By contrast, earnings non-commonality more cleanly reflects the strength of commonalities in underlying economic performance

Earnings Non-commonality vs. Stock Return Non-commonality

- On the other hand, stock return non-commonality has the following advantages:
 - Provides a useful gauge of the economic significance of earnings-based findings
 - Provides greater insight on the anticipated long-run impact of intangible investment
 - Immune from accounting method differences
- Therefore, we replicate our basic tests using stock return non-commonality.

Table 6 – Intangible Investment and Return Non-commonality

DEPENDENT VARIABLE: <i>NONCOMMON_RET</i>			
Variable	Coefficient Estimate	<i>t</i> -statistic	<i>p</i> -value
<i>Intercept</i>	3.475	12.897	<0.001
<i>log(1+INTANGIBLEINTENSITY)</i>	0.522	2.273	0.034
<i>log(MB)</i>	0.026	1.032	0.314
<i>log(MVE)</i>	-0.167	-5.626	<0.001
<i>MKTSHARE</i>	0.109	0.314	0.757
<i>STDROA</i>	0.007	4.323	<0.001
<i>log(1+DIVERS)</i>	0.312	1.601	0.125
<i>log(1+HERF)</i>	-0.968	-4.230	<0.001
<i>log(1+LEVERAGE)</i>	0.024	2.184	0.041
<i>REG</i>	-0.380	-5.704	<0.001
<i>log(NIND)</i>	-0.072	-3.521	0.002
<i>NONCOMMON</i>	0.046	6.958	<0.000
<i>log(1+NREV)</i>	-0.294	-10.102	<0.000
<i>log(1+ΔINST)</i>	0.231	1.356	0.190
<i>log(1+TRADES)</i>	0.482	3.550	0.002
Adjusted R ²	25.62%		
Number of Observations	41,312		

Table 6 – Intangible Investment and Return Non-commonality

DEPENDENT VARIABLE: <i>NONCOMMON_RET</i>			
<u>Variable</u>	<u>Coefficient Estimate</u>	<u>t-statistic</u>	<u>p-value</u>
<i>Intercept</i>	3.186	12.516	<0.001
<i>log(1+SEPARABLEINTENSITY)</i>	0.880	2.979	0.007
<i>log(1+GOODWILLINTENSITY)</i>	1.530	5.202	<0.001
<i>log(1+RDINTENSITY)</i>	-0.853	-2.884	0.009
<i>log(MB)</i>	0.055	2.248	0.036
<i>log(MVE)</i>	-0.171	-5.928	<0.001
<i>MKTSHARE</i>	0.584	1.803	0.087
<i>STDROA</i>	0.007	4.853	<0.001
<i>log(1+DIVERS)</i>	0.437	2.418	0.025
<i>log(1+HERF)</i>	-1.060	-4.517	<0.001
<i>log(1+LEVERAGE)</i>	-0.006	-0.563	0.580
<i>REG</i>	-0.387	-5.843	<0.001
<i>log(NIND)</i>	-0.012	-0.761	0.455
<i>NONCOMMON</i>	0.047	7.277	<0.001
<i>log(1+NREV)</i>	-0.287	-10.492	<0.001
<i>log(1+ΔINST)</i>	0.126	0.756	0.459
<i>log(1+TRADES)</i>	0.414	3.084	0.006
Adjusted R ²	27.03%		
Number of Observations	41,312		

Table 7 – Appropriability Conditions and Returns Non-commonality

DEPENDENT VARIABLE: <i>NONCOMMON_RET</i>			
<u>Variable</u>	<u>Coefficient Estimate</u>	<u>t-statistic</u>	<u>p-value</u>
<i>Intercept</i>	2.523	7.865	<0.001
<i>log(1+SEPARABLEINTENSITY)</i>	0.902	1.892	0.073
<i>log(1+GOODWILLINTENSITY)</i>	1.103	2.624	0.016
<i>log(1+RDINTENSITY)</i>	-1.683	-3.483	0.002
<i>log(1+RDINTENSITY) × LEGALRIGHTS</i>	0.868	2.746	0.013
<i>LEGALRIGHTS</i>	0.075	1.456	0.161
<i>log(MB)</i>	0.065	1.910	0.071
<i>log(MVE)</i>	-0.134	-3.991	0.001
<i>MKTSHARE</i>	-1.175	-1.754	0.095
<i>STDROA</i>	0.001	0.290	0.775
<i>log(1+DIVERS)</i>	0.643	3.196	0.005
<i>log(1+HERF)</i>	-0.716	-0.947	0.355
<i>log(1+LEVERAGE)</i>	0.047	2.829	0.010
<i>log(NIND)</i>	0.062	2.276	0.034
<i>NONCOMMON</i>	0.035	4.289	<0.001
<i>log(1+NREV)</i>	-0.338	-9.470	<0.001
<i>log(1+ΔINST)</i>	0.018	0.065	0.949
<i>log(1+TRADES)</i>	0.750	3.210	0.004
Adjusted R ²	26.51%		
Number of Observations	19,343		

Intangible Investment and Profitability Forecasts

- We examine the implications of our findings on the earnings forecasting task.
- We relate intangible investment to the performance of profitability forecast models set forth in Fairfield, Ramnath and Yohn (2009).

Table 8 – Intangible Investment and Profitability Forecasts

Panel A: Summary of Profitability Forecast Improvements

	Market-wide vs. Random-Walk		Industry-specific vs. Market-wide	
	Value	p-value	Value	p-value
Mean Improvement	0.003	<0.001	0.000	0.727
Median Improvement	0.001	<0.001	0.000	0.273
N	87,865		87,865	

Panel B: DEPENDENT VARIABLE: *IMPROVE_MKT*

<u>Variable</u>	<u>Coefficient Estimate</u>	<u>t-statistic</u>	<u>p-value</u>	<u>Coefficient Estimate</u>	<u>t-statistic</u>	<u>p-value</u>
<i>Intercept</i>	0.003	14.32	<0.001	0.003	14.09	<0.001
<i>log(1+INTANGIBLEINTENSITY)</i>	-0.002	-1.59	0.111	—	—	—
<i>log(1+SEPARABLEINTENSITY)</i>	—	—	—	-0.005	-1.87	0.061
<i>log(1+GOODWILLINTENSITY)</i>	—	—	—	-0.006	-3.05	0.002
<i>log(1+RDINTENSITY)</i>	—	—	—	0.004	2.05	0.040
Adjusted R ²	0.00%			0.02%		
Number of Observations	87,865			87,865		

Table 8 – Intangible Investment and Profitability Forecasts

<u>Variable</u>	<u>Coefficient Estimate</u>	<u>t-statistic</u>	<u>p-value</u>		<u>Coefficient Estimate</u>	<u>t-statistic</u>	<u>p-value</u>
<i>Intercept</i>	-0.000	-1.46	0.144		-0.000	-1.78	0.074
<i>log(1+INTANGIBLEINTENSITY)</i>	0.001	1.85	0.065		—	—	—
<i>log(1+SEPARABLEINTENSITY)</i>	—	—	—		0.001	1.49	0.135
<i>log(1+GOODWILLINTENSITY)</i>	—	—	—		-0.004	-5.18	<0.001
<i>log(1+RDINTENSITY)</i>	—	—	—		0.005	6.79	<0.001
Adjusted R ²	0.00%				0.08%		
Number of Observations	87,865				87,865		

Sensitivity Analyses

Our inferences are robust to the following additional procedures:

- We use 4-digit SIC codes instead of 2-digit SIC codes
- We limit sample to those with non-zero values of *INTANGIBLEINTENSITY*.
- We replicate our tests using non-overlapping subsamples to further address serial correlation.
- We redefine ROA using EBITDA in order to insulate our ROA measure from potential differences in accounting practices that might not be controlled for in our regression analyses.

Conclusion

- Intangible investments contribute positively to earnings non-commonality , consistent with RBV.
- Separable recognized intangible assets contribute more than R&D or goodwill to earnings non-commonality, suggesting that intangibles that arise from legal or contractual rights behave less like public goods.
- The contribution of R&D to earnings non-commonality depends on the strength of property rights protection in the industry, highlighting the importance of appropriability conditions.

Conclusion

These insights are likely to be important to:

- Those engaged in fundamental analysis
- Academics interested in economic properties of intangibles
- Standard setters concerned about the controllability of intangibles
- Managers seeking to maximize the economic benefits from their intangible investments.