Discussion:

The Real Effect of Accounting for Software Development Costs on Corporate Innovation

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Summary of the study - I

- Setting: implementation of SFAS-86, which introduced mandatory capitalization of software development costs – subject to assessment of technical feasibility and the probability of future benefit.
- difference-in-difference (DID) approach and Propensity Score Matching (PSM) technique
- Period 1981 to 1991 – 1986 excluded.
- *4 Hypotheses:*

  H1: *Compared to other high-tech firms, innovation quantity of software firms increases more in the post SFAS-86 period.*
  H2: *Compared to other high-tech firms, innovation quality of software firms improves more in the post SFAS-86 period.*
  H3a*: Compared to other high-tech firms, the software firms file more explorative patents in the post SFAS-86 period than the pre SFAS-86 period.*
  H3b*: Compared to other high-tech firms, the software firms file more exploitative patents in the post SFAS-86 period than the pre SFAS-86 period.*

Summary of the study - II

Findings:

a) public software firms' quantity of innovation output increases significantly more in the post-SFAS-86 period than that of other high-tech public firms.

b) the scientific value of treatment firms' patents also increases in the post-86 period relative to the control group.

c) software public firms increase explorations of new knowledge and diversity in their innovation portfolio in the post-SFAS-86 period.

Contributions

a) “This study contributes to the literature studying the costs and benefits of accounting treatments of R&D assets (Lev and Sougiannis, 1996). Prior studies provide evidence on the impact of SFAS-86 on software firm valuation (Aboody and Lev, 1998), information asymmetry (Mohd, 2005) and earnings quality (Ciftci, 2010).”

Indeed, this study provides evidence on innovation output (Brav et al., 2018) i.e., indirect/real effects (Leuz and Wysocki, 2016)

b) Closely related studies:

1. Dinh et al. (2019) compare the level of underinvestment and overinvestment in R&D expenditures between software firms and other high-tech firms under SFAS-86.
2. Li (2012) compares the effect of SFAS-86 on capitalizing firms’ innovation efficiency with that of expensing firms.

Indeed, this study uses patent information – not looking at R&D expenditure.

However, these studies consider aspects of actual capitalization vs expensing SD costs – scope for consideration in this study.

Key take-away in terms of policy implications?

(p.7) "*SFAS-86 focuses on a narrow class of innovation (software) and provides specific requirements on how to establish technological feasibility, as well as the activities that firms should perform as evidence of technological feasibility."*

Should the IASB consider a specific standard for Software firms? What is the probability of this happening?

(p.7) "*To the extent that these specific requirements of IAS-38 and SFAS-86 improve users' information sets that bring real benefits, standard setters may consider providing more detailed requirements and guidance in accounting standard to assist firms in communicating technical R&D information to users.*"

Number of IAS 38 criteria to be reduced along with criteria and guidance to be more detailed?

(This is requested by users (see Mazzi et al., 2022).

And, any implications for FASB?

Sample

(P12) "*our control group include non-software high-tech public firms, which are publicly listed firms that have filed at least one patent other than software in the pre SFAS-86 period.*"

- SIC codes?
- Any restrictions for being in both the pre- and post- periods?
- Are they all R&D active?
- How many of the software firms are capitalizers and how many expensers, in the post period?

My sample of firms in the software industries includes firms engaged in computer programming and prepackaged software (SIC 7370–7374). Based on the classification in Francis and Schipper (1999), other high-tech firms are those in the following three-digit SIC codes: 283 (drugs), 357 (computer and office equipment), 360 (electrical machinery and equipment), 361 (electrical transmissions and distribution equipment), 362 (electrical industrial apparatus), 363 (household appliances), 364 (electrical lighting and wiring equipment), 365 (household audio, video equipment, and audio receiving), 366 (communication equipment), 367 (electronic equipment, semiconductors), 368 (computer hardware), 481 (telephone communications), and 873 (research, development, and testing services). I also include in other high-tech firms the three-digit SIC code 737 (computer programming, software, and data processing) other than software firms.

Same in Dingh et al., (2019)

Research design - I

The empirical model is as follow:

$$INNOVATION_{it} = \alpha_0 + \beta_1 TREAT_i \times POST_t + \beta_2 SIZE_{it} + \beta_3 ROA_{it} + \beta_4 CAPEX_{it} + \beta_5 TANGIBLES_{it} + \beta_6 R\&D_{it} + \beta_7 CASH_{it} + \beta_8 LEVERAGE_{it} + \beta_9 TOBINQ_{it} + \beta_{10} FOLLOW_{it} + Firm\text{-}fixed\ Effects + Year\text{-}fixed\ Effects + \varepsilon_{it} \quad (1)$$

A minor issue: Perhaps consider adding Compustat items in the appendix

a) Cites is considered a measure of quantity – shouldn't be quality? (See Hall et al., 2001; Brav et al., 2018)

a) Has the post period accounted for capitalized SD? (Mohd, 2005)
b) Should or could this be lagR&D?

b) Patent applications filed toward the end of the sample period are underrepresented. Solution: Hall, et al (2001, 2005) propose "weight factors".
c) sample-end censoring …. correct the bias by dividing the observed citation counts by the fraction of predicted lifetime citations based on a citation-lag distribution. (From Brav et al., 2019, P.242)

Research design - II

(P.13) "*We match each public software firm with control firms with similar propensity score estimated using firm size, sales turnover, book to market value, capital expenditure, tangible assets, and level of leverage on an annual basis.*"

Shouldn't R&D expenditure be there?

Research design - III

The empirical model is as follow:

$$INNOVATION_{it} = \alpha_0 + \beta_1 TREAT_i \times POST_t + \beta_2 SIZE_{it} + \beta_3 ROA_{it} + \beta_4 CAPEX_{it} + \beta_5 TANGIBLES_{it} + \beta_6 R\&D_{it} + \beta_7 CASH_{it} + \beta_8 LEVERAGE_{it} + \beta_9 TOBINQ_{it} + \beta_{10} FOLLOW_{it} + Firm\text{-}fixed\ Effects + Year\text{-}fixed\ Effects + \varepsilon_{it} \quad (1)$$

Barthelme et al., 2018, p12.

$$ASSET\_ALLOC_{it} = \beta_0 + \beta_1 TREAT_{it} + \beta_2 Post_{it} + \beta_3 Post \times TREAT_{it} + \sum_{k=4}^{21} \beta_k Controls_{it} + \varepsilon_{it}. \quad (2)$$

Lennox, 2016, p1509.

	Accounting Misstatements ($MISS_{it}$)		Tax-Related Misstatements ($TAXMISS_{it}$)		Going-Concern Audit Opinions (GC_{it})	
	Full Sample (1)	Matched Sample (2)	Full Sample (3)	Matched Sample (4)	Full Sample (5)	Matched Sample (6)
$TREAT_i$	0.27***	0.22**	0.49***	0.35*	−0.17	0.02
	(3.39)	(2.30)	(3.10)	(1.87)	(−0.78)	(−0.13)
$TREAT_i \times POST_t$	−0.04	0.21	−0.01	0.29	0.29*	−0.01
	(−0.34)	(1.27)	(−0.01)	(0.91)	(1.66)	(−0.02)
$POST_t$	−1.11***	−1.38***	−0.79***	−1.12***	−0.17*	0.08
	(−17.63)	(−10.43)	(−5.82)	(−4.33)	(−1.90)	(0.43)

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Findings - I

Table 3: Main Results

Panel A: The effect of SFAS-86 on innovation quantity

	Unmatched Sample		PSM Matched Sample	
	(1)	(2)	(3)	(4)
Variables	$PATENT_{it}$	$CITES_{it}$	$PATENT_{it}$	$CITES_{it}$
$TREAT_i \times POST_t$	0.155***	0.248**	0.158*	0.434***
	(2.59)	(2.45)	(1.73)	(2.72)

Panel B: The effect of SFAS-86 on innovation quality

	Unmatched Sample				PSM Matched Sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	AVG$CITE_{it}$	$GENERAL_{it}$	$ORIGINAL_{it}$	$VALUE_{it}$	AVG$CITE_{it}$	$GENERAL_{it}$	$ORIGINAL_{it}$	$VALUE_{it}$
$TREAT_i \times POST_t$	0.118**	0.036*	0.044**	-0.105	0.298***	0.094***	0.103***	-0.307**
	(2.01)	(1.80)	(2.20)	(-1.37)	(3.04)	(2.72)	(3.13)	(-2.03)

Panel C: The effect of SFAS-86 on innovation strategy

	Unmatched Sample			PSM Matched Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	$EXPLOIT_{it}$	$EXPLORE_{it}$	$DIVERSITY_{it}$	$EXPLOIT_{it}$	$EXPLORE_{it}$	$DIVERSITY_{it}$
$TREAT_i \times POST_t$	0.006	0.041*	0.043**	0.015	0.070*	0.078***
	(0.63)	(1.89)	(2.43)	(1.25)	(1.93)	(2.97)

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Findings - II

Table 6: Effects of SFAS-86 on Innovation of Financially Constraints Firms

	Quantity		Quality				Strategy		
Variables	$PATENT_{it}$	$CITES_{it}$	$AVGCITE_{it}$	$GENERAL_{it}$	$ORIGINAL_{it}$	$VALUE_{it}$	$EXPLOIT_{it}$	$EXPLORE_{it}$	$DIVERSITY_{it}$
$TREAT_i \times POST_t \times KZ_{it}$	0.140	1.042*	0.865**	0.369***	0.067	-0.521	-0.020	0.277*	0.166
	(0.41)	(1.72)	(2.35)	(2.72)	(0.51)	(-0.99)	(-0.39)	(1.91)	(1.60)
$TREAT_i \times KZ_{it}$	-0.692**	-2.200***	-1.618***	-0.521***	-0.195	0.030	0.006	-0.322*	-0.212*
	(-2.04)	(-3.59)	(-3.98)	(-3.44)	(-1.17)	(0.03)	(0.10)	(-1.87)	(-1.70)
$POST_t \times KZ_{it}$	0.005	-0.246	-0.211	-0.197*	-0.012	0.565	0.036	-0.098	-0.053
	(0.02)	(-0.51)	(-0.76)	(-1.84)	(-0.12)	(1.22)	(0.86)	(-0.84)	(-0.73)
$TREAT_i \times POST_t$	0.081	-0.021	-0.074	-0.036	0.066	-0.296	0.019	-0.042	0.022
	(0.55)	(-0.08)	(-0.51)	(-0.67)	(1.24)	(-1.33)	(0.82)	(-0.65)	(0.59)

Table 7: Effects of SFAS-86 on Innovation of Firms Just Meeting Earning Benchmark

	Quantity		Quality				Strategy		
Variables	$PATENT_{it}$	$CITES_{it}$	$AVGCITE_{it}$	$GENERAL_{it}$	$ORIGINAL_{it}$	$VALUE_{it}$	$EXPLOIT_{it}$	$EXPLORE_{it}$	$DIVERSITY_{it}$
$TREAT_i \times POST_t \times MEET_{it}$	-0.456*	-1.494***	-1.139***	-0.392***	-0.220*	-0.628	0.041	-0.260	-0.216**
	(-1.76)	(-3.15)	(-2.87)	(-2.95)	(-1.89)	(-0.95)	(0.67)	(-1.56)	(-2.03)
$TREAT_i \times POST_t$	0.176*	0.500***	0.349***	0.112***	0.113***	-0.282*	0.013	0.082**	0.088***
	(1.91)	(3.05)	(3.46)	(3.12)	(3.23)	(-1.90)	(1.05)	(2.13)	(3.23)
$TREAT_i \times MEET_{it}$	0.228	0.908**	0.809**	0.220*	0.152	0.174	0.011	0.274*	0.193*
	(0.97)	(2.17)	(2.56)	(1.87)	(1.33)	(0.33)	(0.32)	(1.78)	(1.81)
$POST \times MEET_{it}$	0.076	0.515	0.446*	0.178*	0.121	0.175	-0.016	0.153	0.118
	(0.32)	(1.39)	(1.74)	(1.81)	(1.42)	(0.29)	(-0.39)	(1.08)	(1.35)

Overall comment

- Very interesting study and innovative idea
- Subject to improvement, there is scope for good contribution and policy implications

Good luck with the revisions!!


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