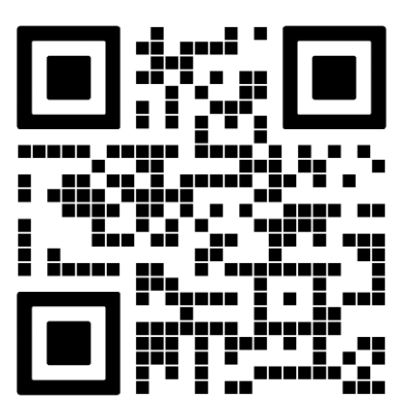# Innovative Intangible Assets in M&As: The Impact of <u>Radical and Incremental</u> Innovations on Acquirer Firms

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Introduction

Can acquirers put purchased innovations to good use? Yes. Using novel hand-collected data, I differentiate between radical and incremental innovations, showing both add value: incremental innovations reduce costs, while radical innovations drive future patents. However, markets tend to undervalue these innovations at deal announcements.

Innovations: Radical vs Incremental

Innovation is the process of translating new ideas or inventions into production factors that create economic value. (Kogan and Papanikolaou, 2019)

"... **radical innovation**, which involves combining diverse ideas to generate a technological improvement in a new area. ... firms can engage in **incremental innovation** by building on their existing leading-edge products." (Acemoglu et al., 2022)
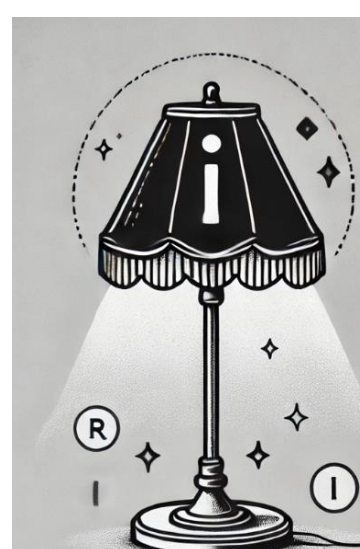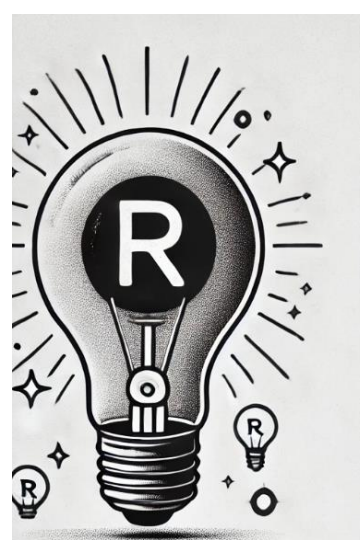
Methodology

1. Develop empirical measures to distinguish between radical and incremental innovations *using novel PPA data*
2. Identification of characteristics of acquirer firms that predetermine the purchase of each type of innovation *(Tobit model)*
3. Success in adopting purchased innovations: the contribution of purchased radical and incremental innovations to the short-term and long-term performance of the combined entity *CARs, Sales Growth, Costs, Patents*

Additional Results

Tobit Acquirer Characteristics	$Innov./Val.of Trans. Mean = 0.164	$Radical/ $Innov. Mean = 0.163	$Increm./$Innov. Mean = 0.410	
Cash/Assets *(std 0.14)*	0.022 (0.725)	0.007 (0.867)	0.223** (0.025)	$0.14 \times 0.233 = 0.03$ ↑ std ⇒ 8% *(of mean)*
Debt/Assets	-0.051** (0.038)	-0.069* (0.086)	-0.098 (0.140)	
Foreign income/Assets	0.244*** (0.000)	0.501*** (0.000)	0.305 (0.147)	$0.06 \times 0.501 = 0.03$ ↑ std ⇒ 18% *(of mean)*
R&D exp/Assets	0.265 (0.117)	0.410*** (0.001)	0.129 (0.698)	
...	...	...	...	

Firms emphasizing international presence are more likely to acquire radical innovations that yield greater value when widely deployed, while firms holding substantial cash reserves tend to focus on incremental innovations.
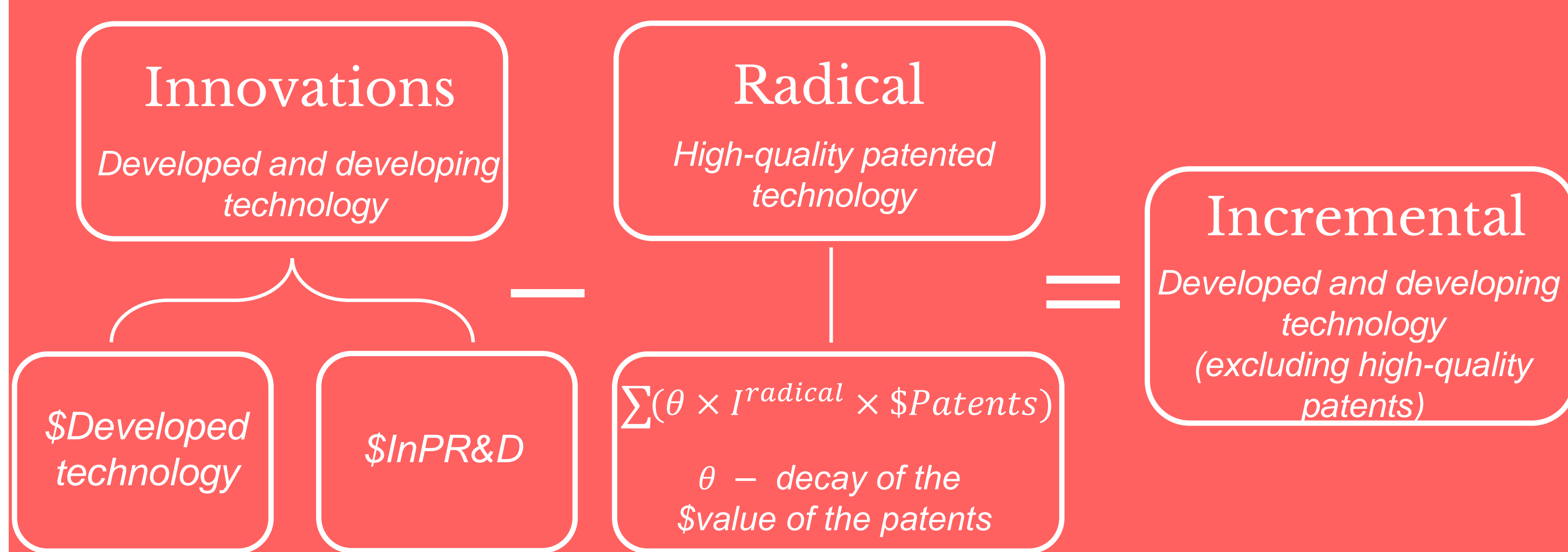
	Full Sample N=1,180	$Innov =0 N=486	$Innov >0 N=694	Diff.
$CAR^{FF}[-1,+1]$	-0.027***	-0.016***	-0.034***	-0.018***
$CAR^{FF}[-2,+2]$	-0.039***	-0.029***	-0.046***	-0.017***

The negative market reaction stems from information asymmetry and valuation difficulties for innovative assets. Since PPA data only emerge after deal completion, shareholders lack this information at the announcement date, making highly innovative targets appear overvalued due to limited on-balance-sheet visibility.

Radical and Incremental Innovations add value to the acquirer. However, the **synergy effect** depends on the type of purchased innovations.

$$\$ Innovations \neq \sum \omega Patents$$

Innovations
Developed and developing technology

Radical
High-quality patented technology

Incremental
Developed and developing technology (excluding high-quality patents)

$Developed technology   *$InPR&D*

$\sum(\theta \times I^{radical} \times \$Patents)$
θ — decay of the $value of the patents

Purchased in M&A   Performance after M&A

long-term

$Innovations \nearrow \Rightarrow Sales\ Growth \nearrow$

$Incremental \nearrow \Rightarrow Costs \searrow$

$Radical \nearrow \Rightarrow Value\ of\ patents \nearrow$

**short**

$Incremental \nearrow \Rightarrow CARs \searrow$

Deal Characteristics	Preformace measures after M&As			
	$\Delta Sales_{t,t+2}^{n}$ ($\Delta Sales_{t,t+2} = 0.07$)			
$Innov./Val.of Trans. (std 0.34)	0.041*** (0.003)	0.043*** (0.001)	0.033*** (0.007)	$0.34 \times 0.041 = 0.014$ ↑ std ⇒ 20% *(of mean)*
$Radical/ $Innov.		0.033*	0.031	
$Increm./$Innov.			0.020 0.027	
	$COGS_{t+1} / Sales_{t+1}$ ($COGS_{t+1} / Sales_{t+1} = 0.002$)			
$Innov./Val.of Trans.	0.001***	0.001	0.001**	
$Radical/$Innov.		0.002*	0.002*	
$Increm./$Innov. (std 0.46)			-0.001*** (0.001) -0.001*** (0.009)	$0.46 \times -0.001 = -0.46 \times 10^{3}$ ↑ std ⇒ ↓ 23% *(of mean)*
	$Value\ of\ patents_{t,t+3}$ (mean = 0.13)			
$Innov./Val.of Trans.	-0.016	0.006	-0.030	
$Radical/$Innov. (std 0.33)		0.200*** (0.000)	0.200*** (0.000)	$0.33 \times 0.2 = 0.066$ ↑ std ⇒ 50% *(of mean)*
$Increm./$Innov.			0.034 0.027	
	$CAR^{FF}[+1,-1]$ ($\overline{CAR^{FF}[+1,-1]} = -0.027$)			
$Innov./Val.of Trans.	-0.010	-0.010	-0.002	
$Radical/$Innov.		-0.010	-0.015	
$Increm./$Innov. (std 0.46)			-0.017** (0.024) -0.019*** (0.001)	$0.46 \times -0.019 = -0.009$ ↑ std ⇒ 33% *(of mean)*

Data: US public-to-public M&As

Purchase Price Allocation	(in thousands)
... ...	
Intangible assets:	
Core-developed technology	$81,900
Customer relationships	$134,000
Trademark and trade names	$231
In-process R&D	$14,400
Total identified intangible assets	*$241,100*
Goodwill	*$575,750*
... ...	

All deals (1,539)
Innovations (933)
Highly-impactful patents (582)
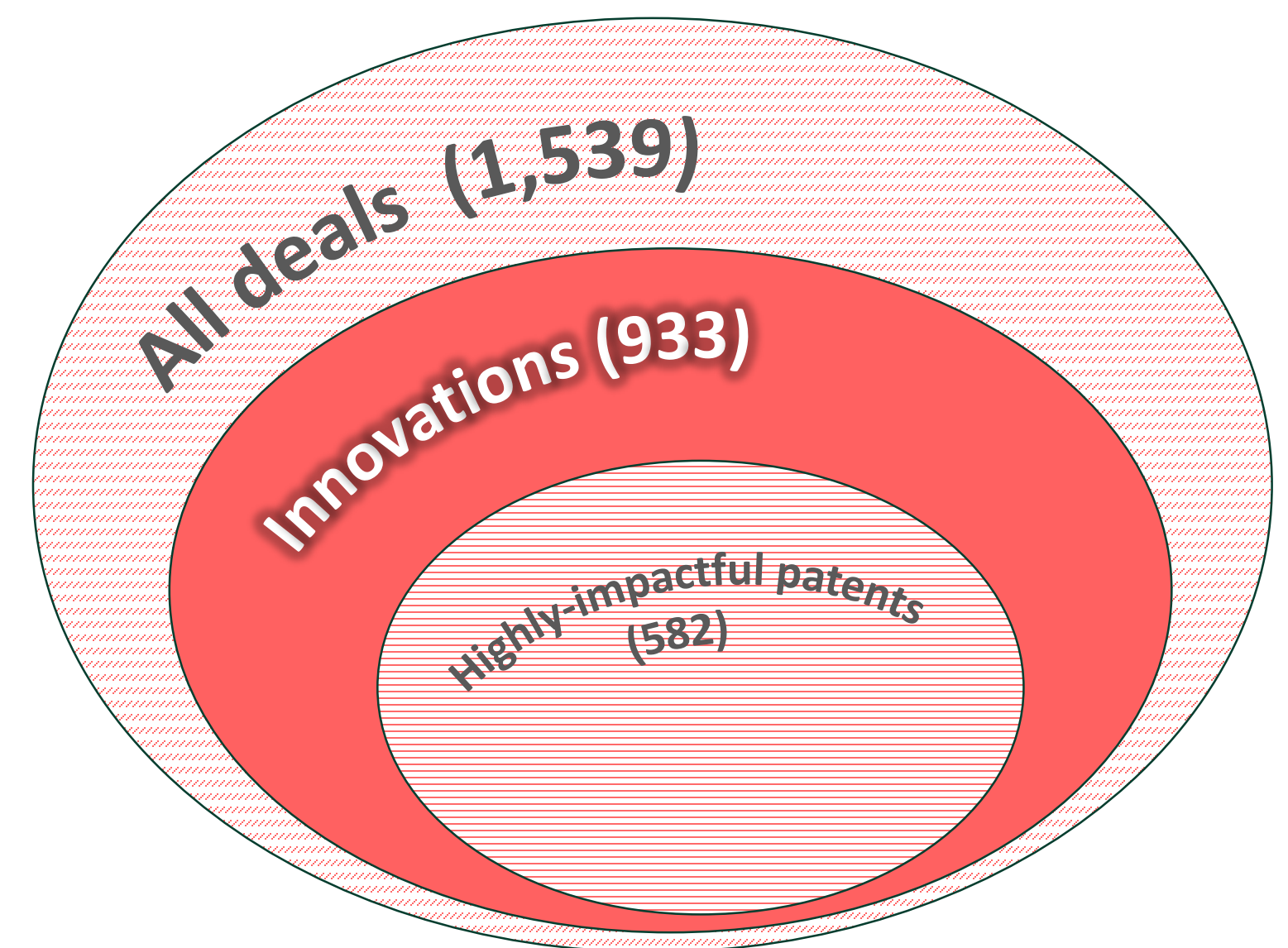
Transactions in underexplored red area are often overlooked. I show their substantial impact, particularly when considering the synergy effects in overall outcomes.

Developed Measures
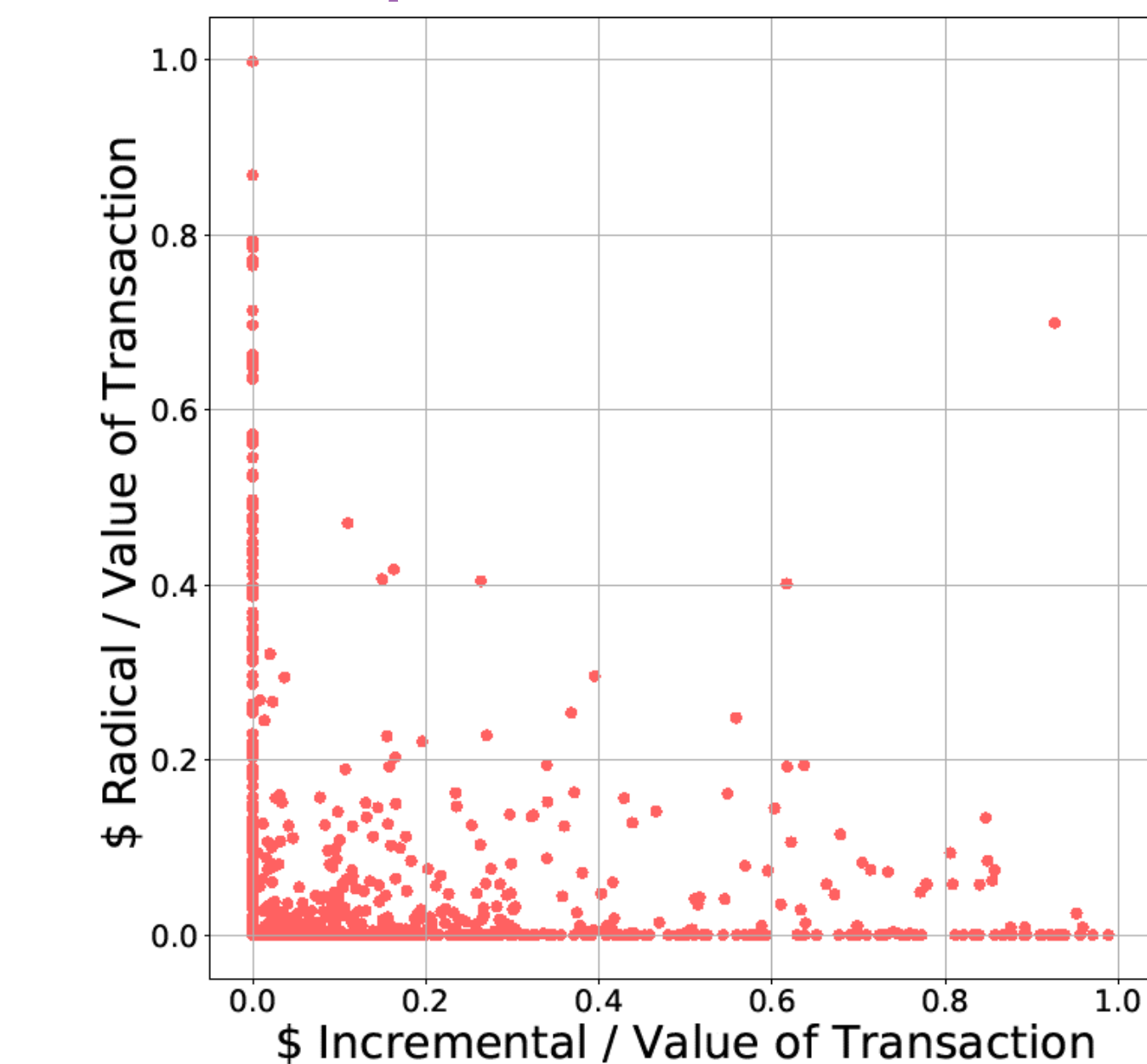
The importance of distinguishing between radical and incremental innovations

	(1)	(2)	(3)	(4)	(5)	(6)
(1) $Innov./Val.of Trans.	1.00					
(2) $Increm./$Innov.	0.45***	1.00				
(3) $Increm./Val.of Trans.	0.98***	0.49***	1.00			
(4) $Radical/$Innov.	0.06*	-0.26***	-0.13***	1.00		
(5) $Radical/Val.of Trans.	0.98***	-0.13***	-0.03	0.11***	1.00	
(6) #of patents_{target}	0.28***	-0.08**	-0.03	0.25***	0.33***	1.00
(7) #of radical patents_{target}	0.20***	-0.09**	-0.03	0.26***	0.26***	0.93***

The developed measures capture aspects of innovation that are not reflected in patent-based metrics. I show the ability to quantify the dollar value of innovations while highlighting their significance in ways distinct from traditional patent-based proxies.