



Rotterdam School of Management, Erasmus Rotterdam University

The Dynamic Impact of AI Investment on Firm Performance & Market Value

MSc Business Information Management
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Author: Thy Cao (673415dc)
Supervisor: Yagmur Ozdemir
Co-reader: Wei Wang

INTRODUCTION



EY

https://www.ey.com/en_gl/insights/workforce/th... ::



McKinsey & Company

<https://www.mckinsey.com/five-fifty-real-world>

The value AI can bring to your b

Unsure where or how AI applies to your company? McKinsey Global Institute found over 400 real-life examples where AI can improve



PwC

<https://www.pwc.com/services/ai> ::



Deloitte

<https://www.deloitte.com>

Unleashing

AI is a transfor

innovation acr



CNBC

<https://www.cnbc.com/2025/06/13/companies-are-b...> ::

the help you define

Companies are bullish on AI but remain skeptical of the ...

13 Jun 2025 — A recent survey of 1,393 technology leaders showed that about two-thirds are accelerating their AI capabilities and about half are embedding AI ...



Reddit · r/ArtificialIntelligence

60+ comments · 2 months ago

The Big Picture 2025: Generative AI

nce found that 83% of organizations expect

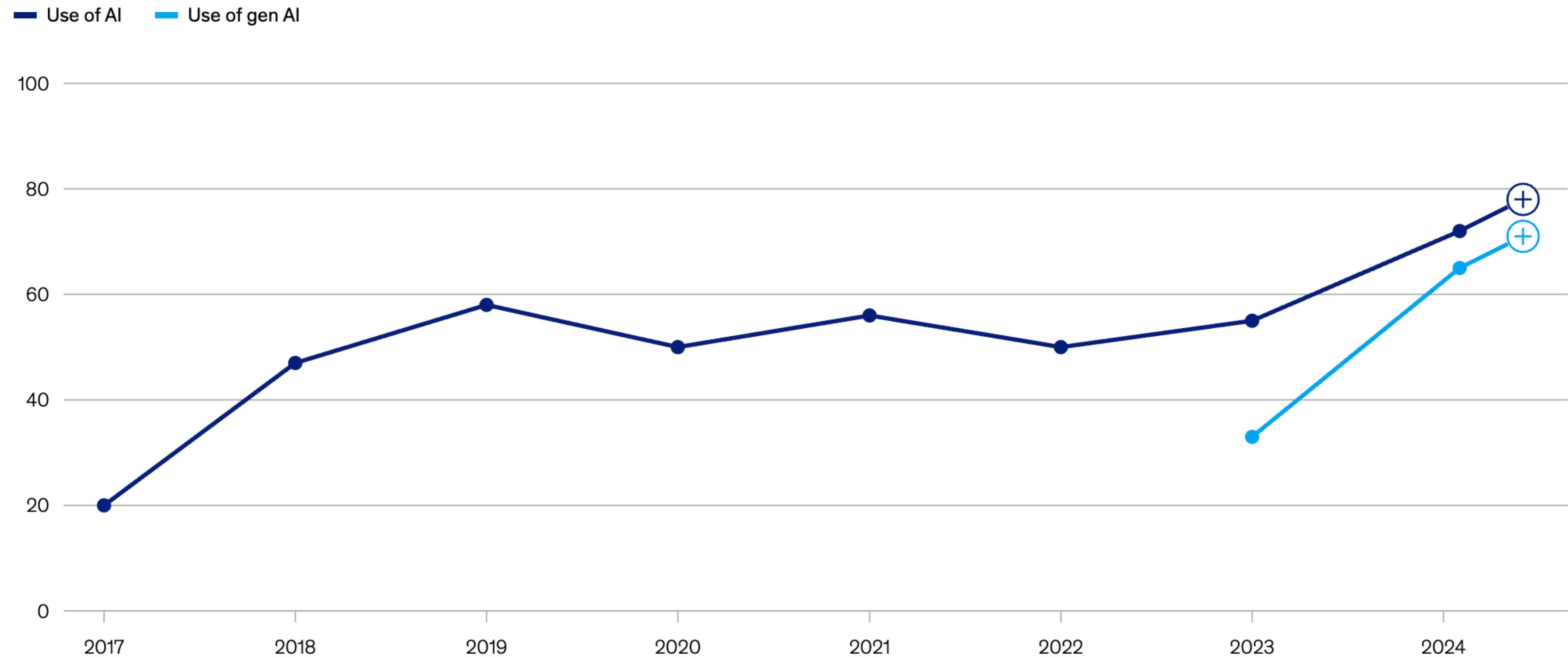
What's the real use of AI in business and companies?

AI in business can be a serious game-changer when used right. In my experience, AI tools really help automate repetitive tasks and improve ...

69 answers · Top answer: Devaluing workers and creating addictive products

Organizations' use of AI has accelerated markedly in the past year, after years of little meaningful change.

Organizations that use AI in at least 1 business function,¹ % of respondents



¹In 2017, the definition for AI use was using AI in a core part of the organization's business or at scale. In 2018–2019, the definition was embedding at least 1 AI capability in business processes or products. Since 2020, the definition has been that the organization has adopted AI in at least 1 function.

PROBLEM

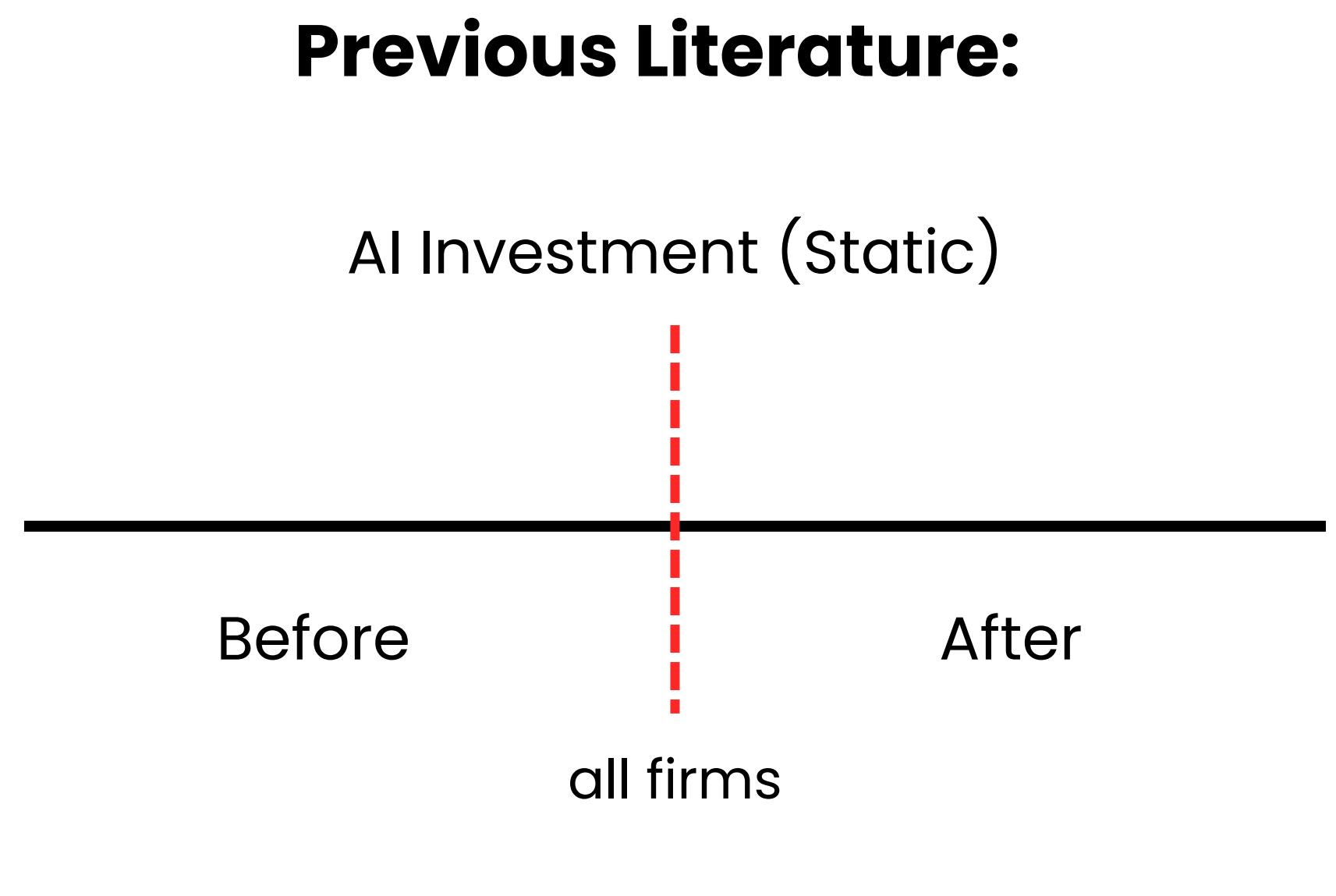
Previous Literature:

AI Investment (Static)

Before

all firms

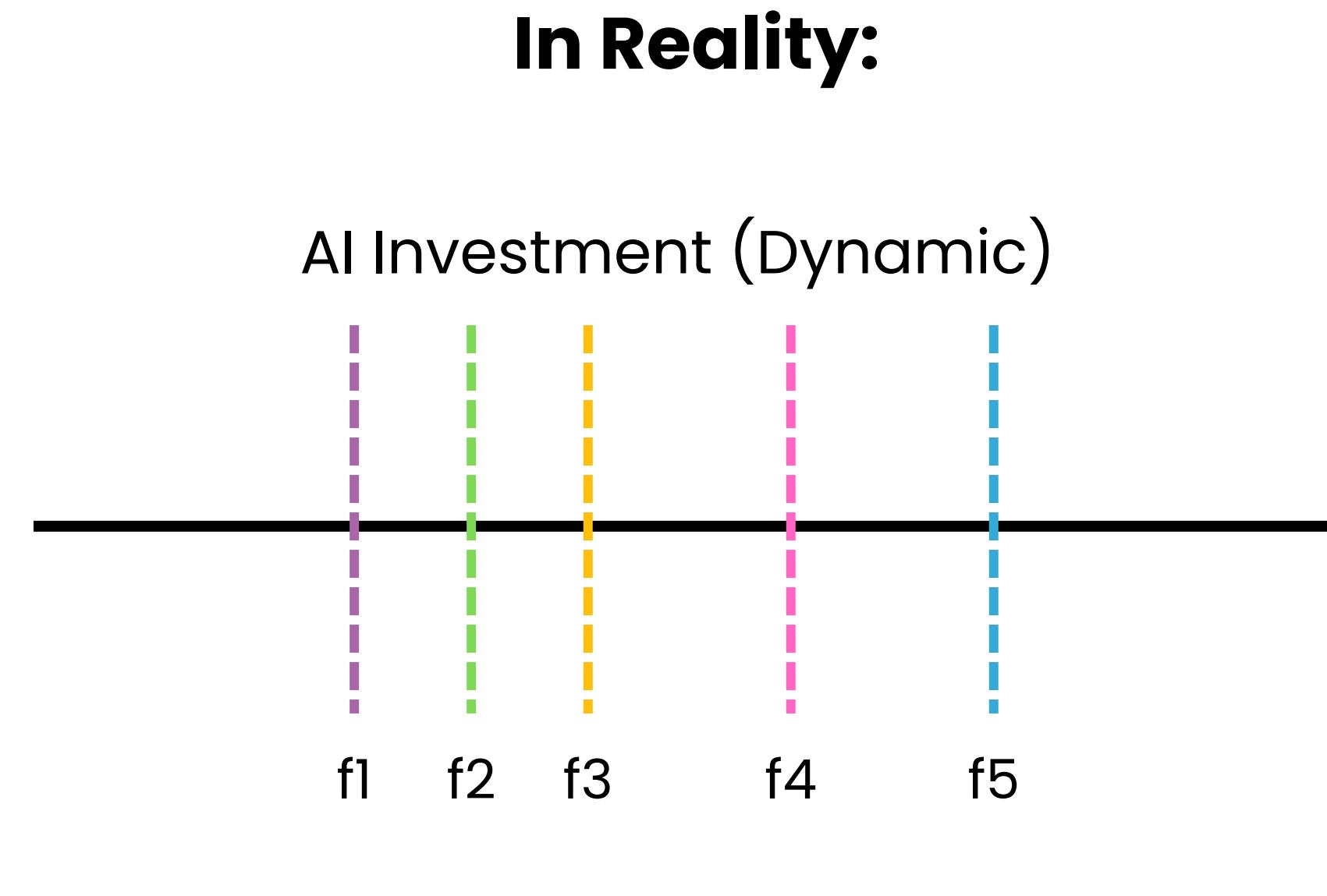
After



In Reality:

AI Investment (Dynamic)

f1 f2 f3 f4 f5



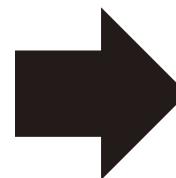
PROBLEM

Investors

- Favour short-term gains
- Neglect long-term values

Managers

- Lack evidence to prove when AI pays off and how long the gains last



Firms have to sacrifice long-term benefits to achieve short-term returns

RESEARCH QUESTIONS

RQ1

When does AI investment pay off?

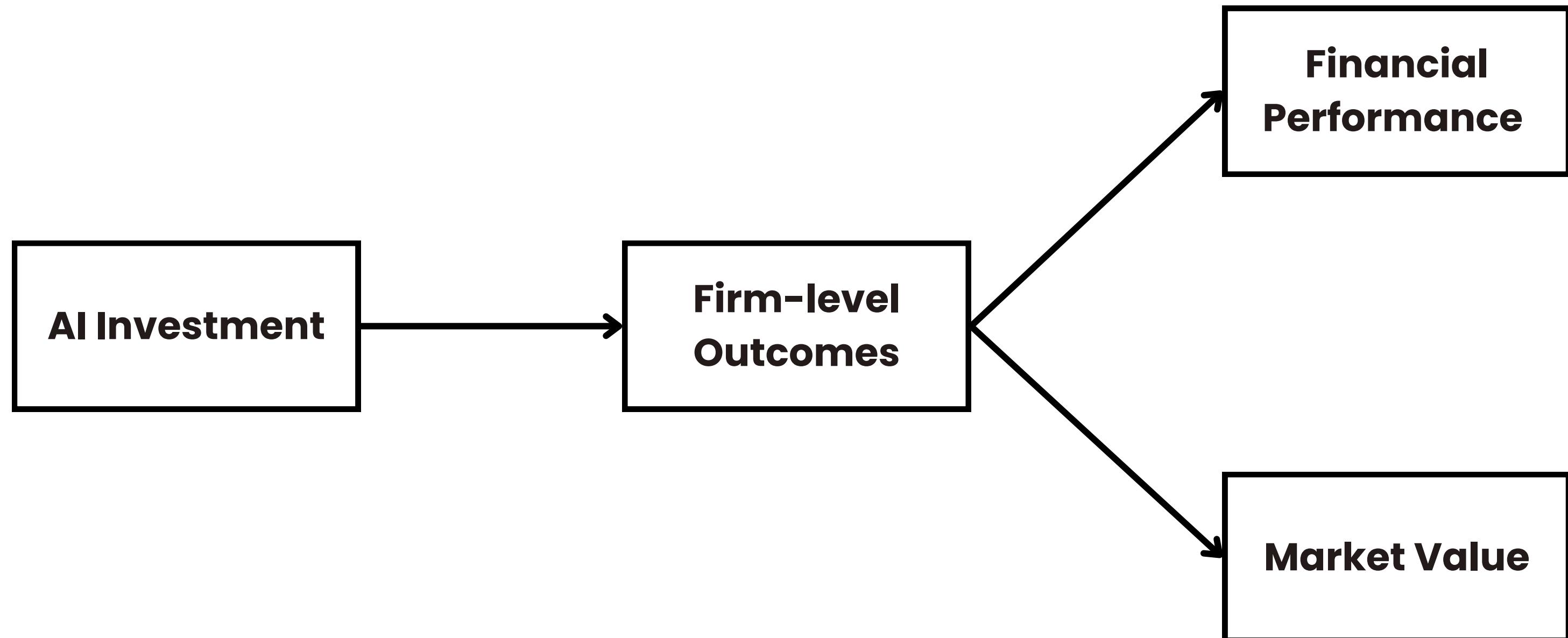
RQ2

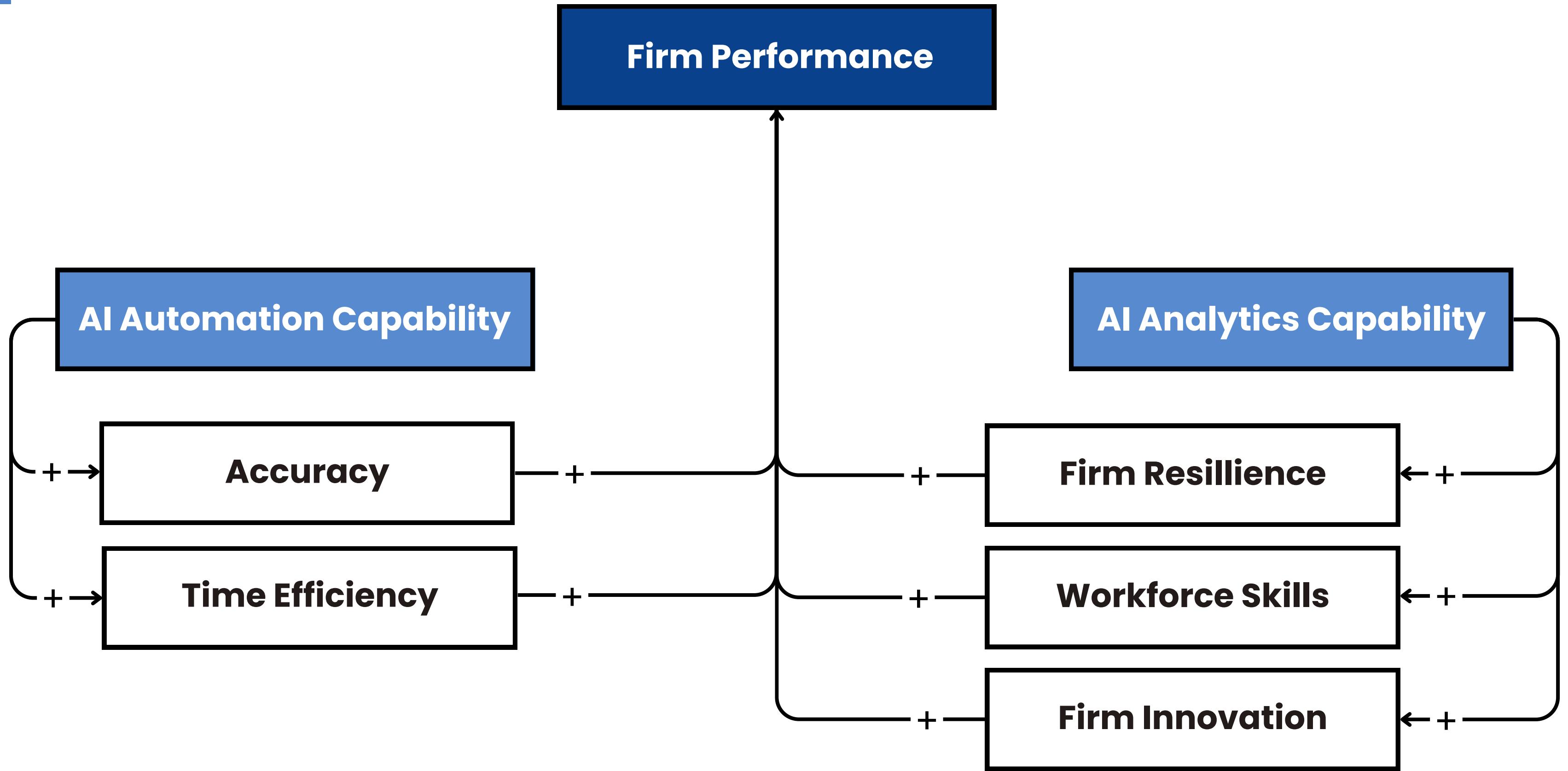
Do the short-term effects of AI investment on firms
differ from its long-term effects?

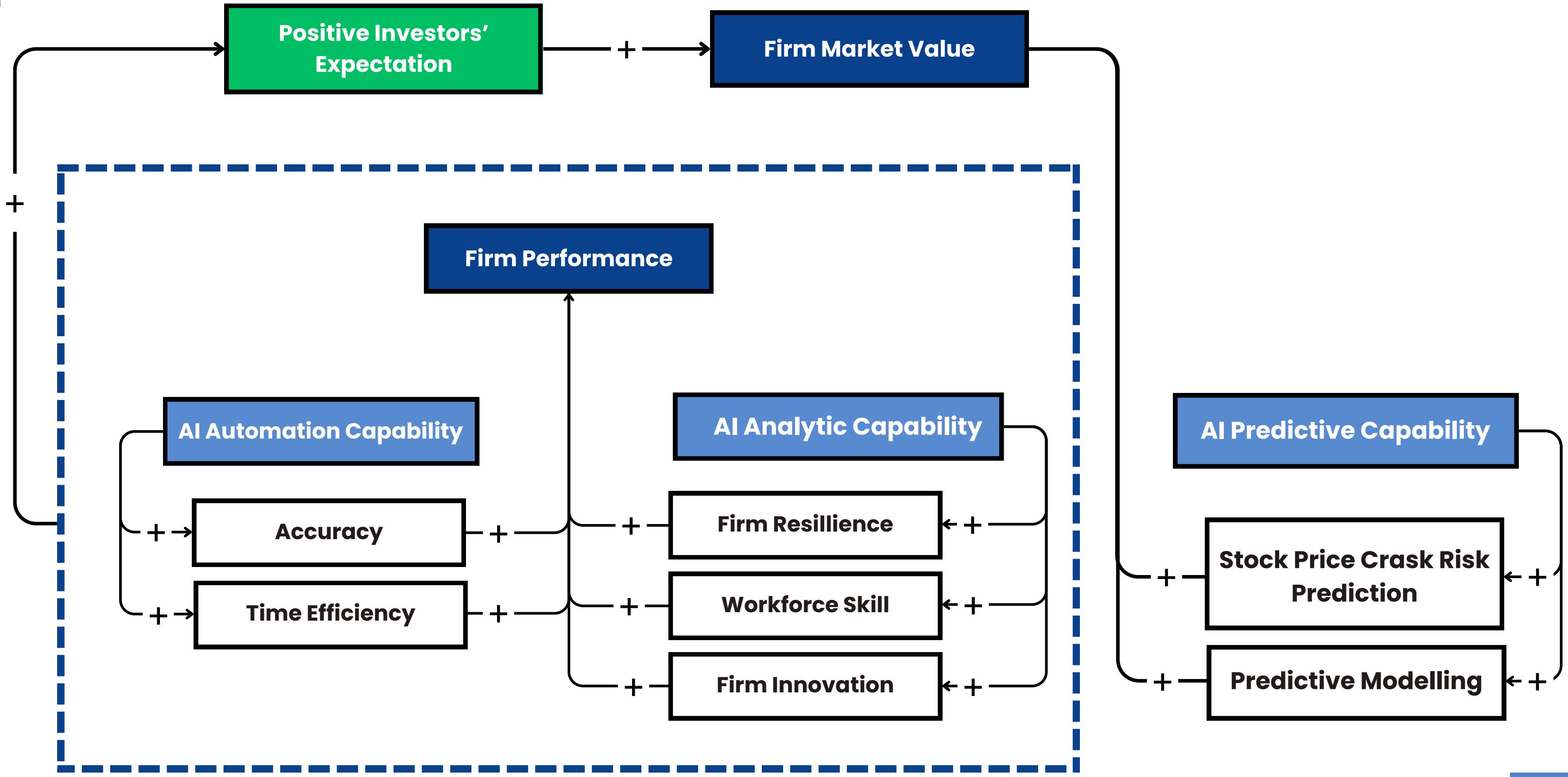
LITERATURE REVIEW

1. Literature Review
2. Conceptual Framework



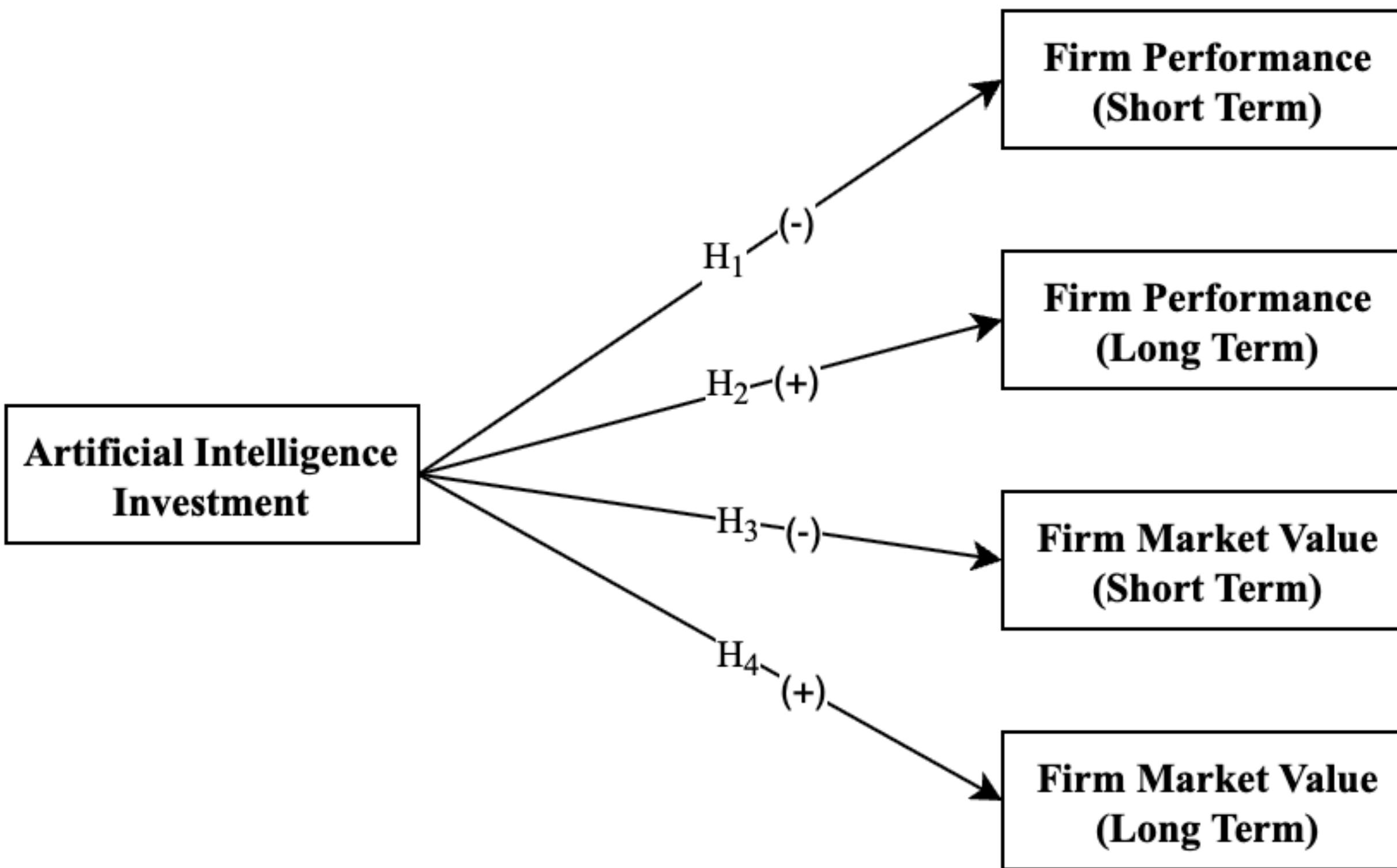






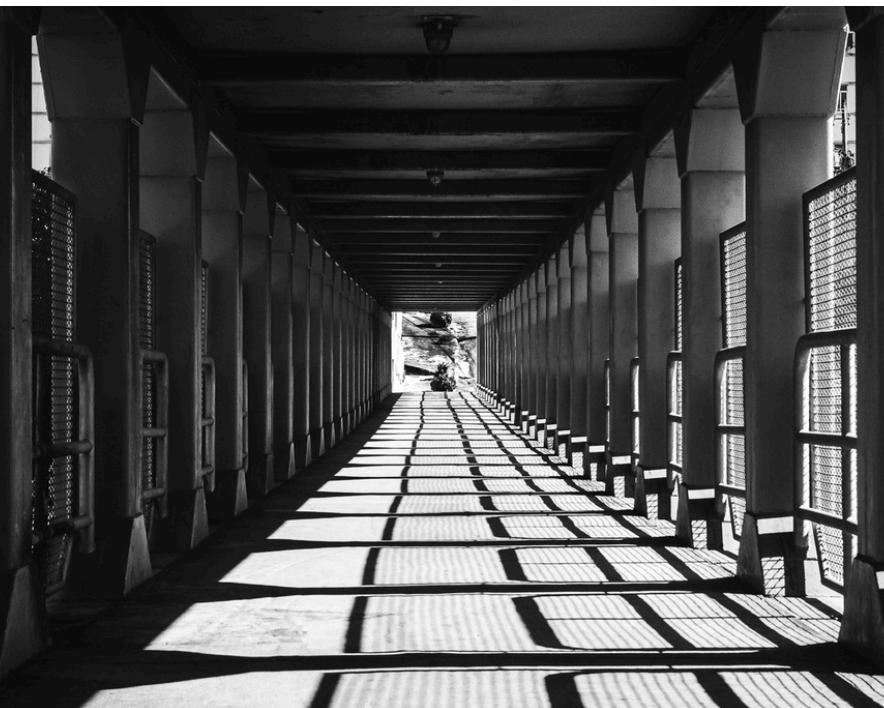
	Financial Performance	Market Value
Short-term	Insignificant or negative due to delay in gains	Negative following the AI investment's announcements
Long-term	Positive	Positive
Scope	U.S. firms from 2013 to 2023	
Hypotheses	<p>H1: AI investment is associated with negative firm performance in the short term.</p> <p>H2: AI investment is associated with positive firm performance in the long term.</p> <p>H3: AI investment is associated with negative firm market value in the short term.</p> <p>H4: AI investment is associated with positive firm market value in the long term.</p>	

CONCEPTUAL FRAMEWORK



METHODOLOGY

1. Data
2. Variable Construction
3. Staggered Difference-in-Difference
& Assumptions



DATA

	Treatment Group	Control Group
Data	S&P Kenso AI Enablers & Adopters Index	S&P 500 Index
Number of Units	61	61

INDEPENDENT VARIABLE CONSTRUCTION

Treatment	AI investment
Treatment Period	The “Effective Date” in the dataset (the initial period that firms announce their AI investments)
Problem	<ul style="list-style-type: none">• The “Effective Date” proxy may not correctly represent the treatment period• AI washing <p>→ Require additional validation step</p>

VALIDATION PROCESS

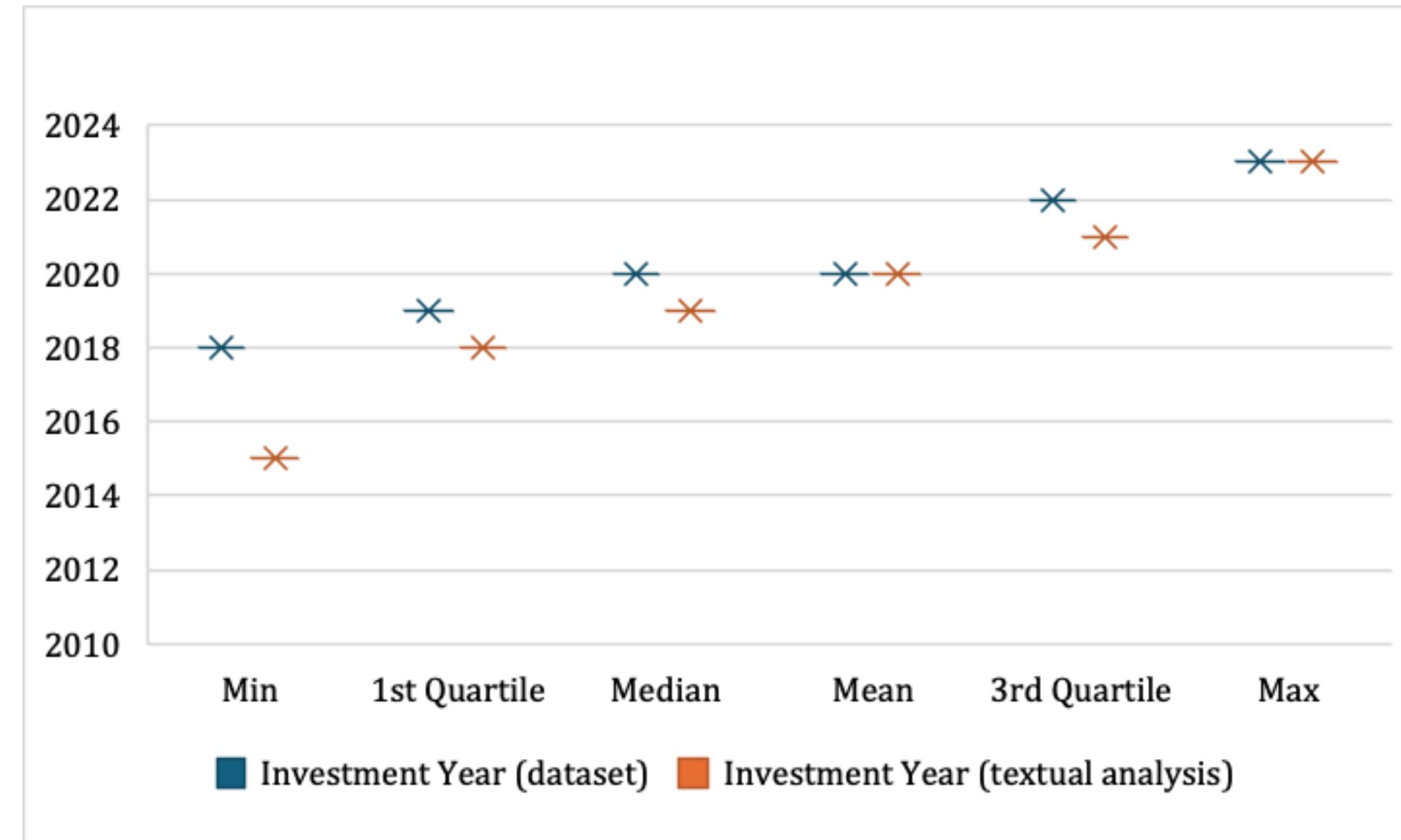
1. Text Extraction (LLM)

- Downloading 10-K/20-F reports (plain text files) via SEC's Edgar
- Clean the files (remove markup tags, metadata, line breaks and white spaces)
- Have GPT-4o (OpenAI) extracted AI-related text

2. Textual Analysis (LLM)

- Upload extracted text on the interface
- Have GPT-o1 analysed the extracted text
- Manually check a random sample of 10 outputs

Descriptive Statistics	Min	1st Quartile	Median	Mean	3rd Quartile	Max
Investment Year (dataset)	2018	2019	2020	2020	2022	2023
Investment Year (textual analysis)	2015	2018	2019	2020	2021	2023



DEPENDENT VARIABLE CONSTRUCTION

Firm Performance	$ROE_{i,t} = \frac{NetIncome_{i,t}}{TotalShareholders'Equity_{i,t}}$	$ROA_{i,t} = \frac{NetIncome_{i,t}}{TotalAssets_{i,t}}$
Firm Market Value	$Tobin'sQ_{i,t} = \frac{TotalAssets_{i,t} + MVofEquity_{i,t} - (BVofEquity_{i,t} + DeferredTax_{i,t} + InvestmentTaxCredits_{i,t})}{TotalAssets_{i,t}}$	
Note	<p>i refers to the individual firm t refers to the specific year MV is market value BV is book value</p>	

CONTROL VARIABLES

Firm Size	$FirmSize_{i,t} = \ln (TotalAssets_{i,t})$
Firm Fixed-effects	working culture, management style, location, etc.
Year Fixed-effects	macroeconomic change, policy shifts

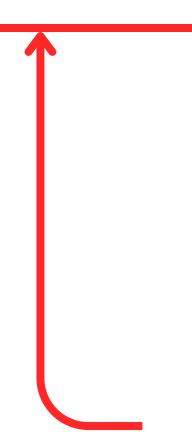
STAGGERED DID

Conventional DID model:

$$Y_{i,t} = \beta_3 \boxed{\text{Time}} \times \text{Treatment}$$

Staggered DID model:

$$Y_{i,t} = \sum_j \beta_j (\boxed{\text{Relativetime}} \times \text{Treatment})$$

- 
- If calendar period > treatment period, relative time dummy is >0.
 - If calendar period < treatment period < 0, relative time dummy is <0.
 - If calendar period = treatment period, relative time dummy is = 0

STAGGERED DID MODEL

$$Y_{i,t} = \sum_j \beta_j (j_{i,t}) + X_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t}$$

The control
variable for firm i
in year t (AT)

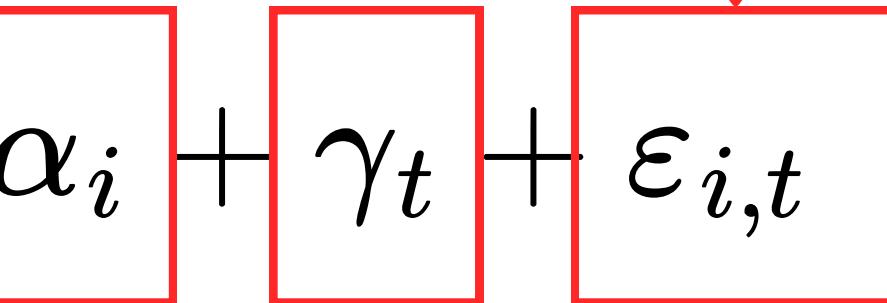
$$Y_{i,t} = \sum_j \beta_j j_{i,t} + X_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t}$$

The dependent
variable for firm i
in year t (ROE,
ROA, TOBIN)

The interaction term of relative
time dummies & treatment
dummies (REL_TIME)

$$Y_{i,t} = \sum_j \beta_j (j_{i,t}) + X_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t}$$

The error term



Year fixed-effects

Firm fixed-effects

STAGGERED DID ASSUMPTIONS

1. Stable Unit Treatment Value Assumption (SUTVA)
2. Conditional Independence Assumption
3. Parallel Trend Assumption

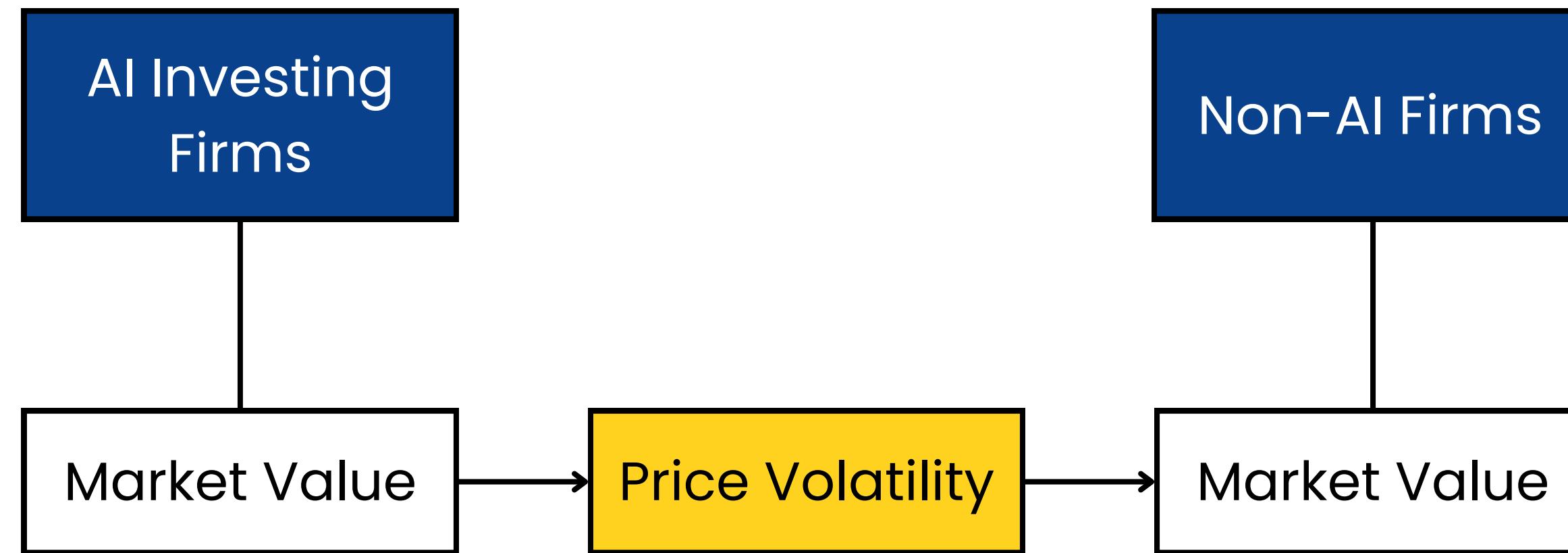
SUTVA

1. Non-interference: treatment status of any unit does not affect outcomes of other units



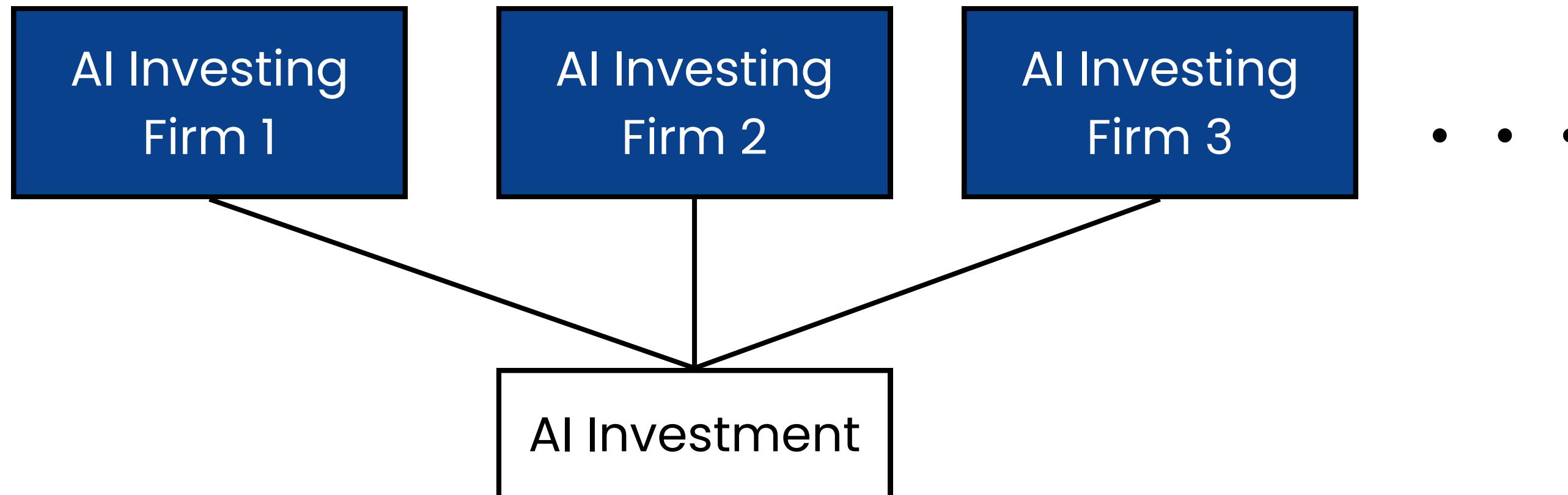
SUTVA

1. Non-interference: treatment status of any unit does not affect outcomes of other units



SUTVA

2. **No variation:** treatment of all units must be comparable



CONDITIONAL INDEPENDENCE ASSUMPTION

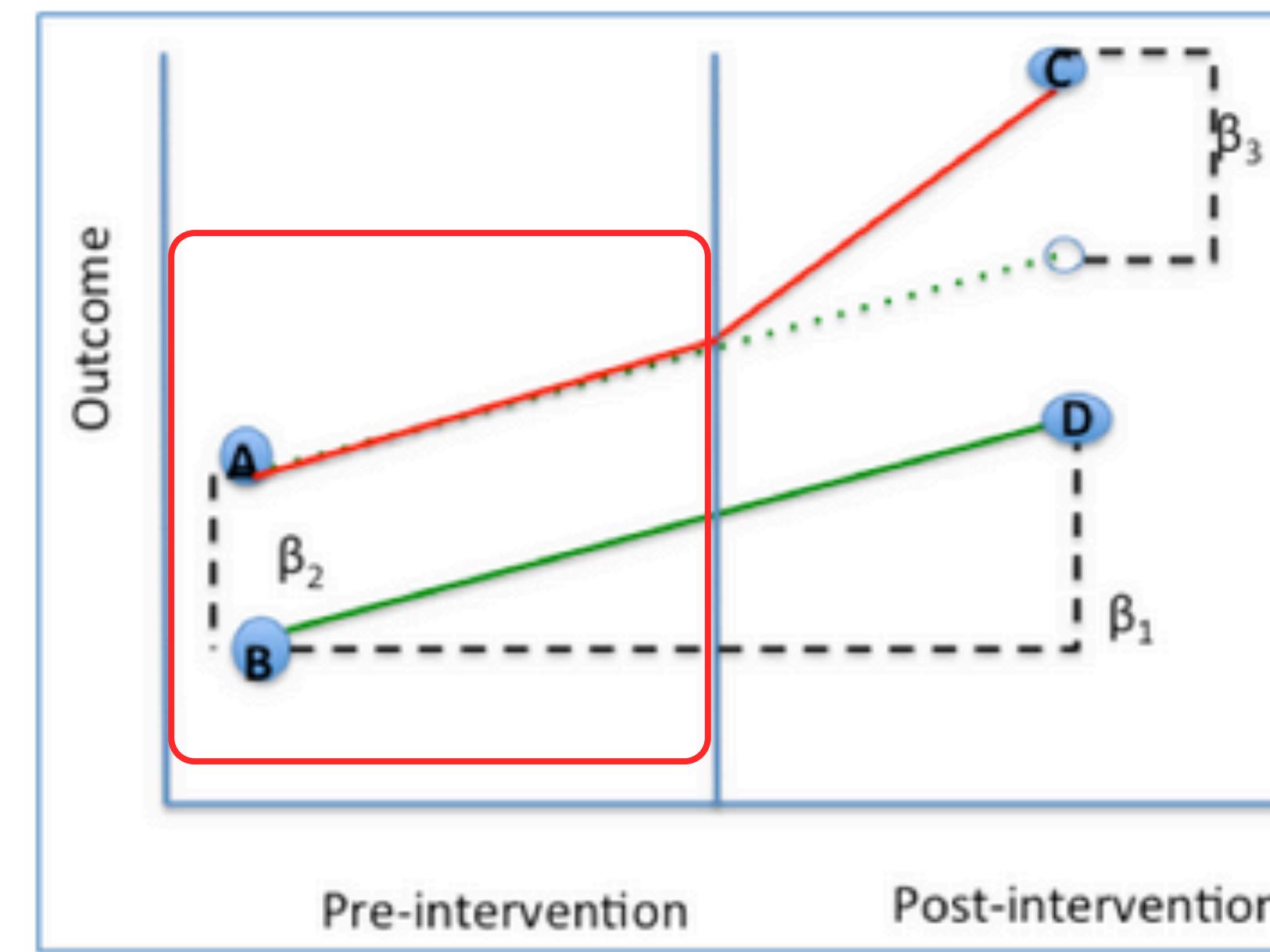
The participation in the treatment group is conditionally random, and the treatment is independent from any potential outcomes.

→ It is unlikely that firms randomly invest in AI. Instead, they are motivated by financial gains, enhanced capabilities and productivity.

→ Our study includes firm and year fixed effects and controls firm size to control for confounders.

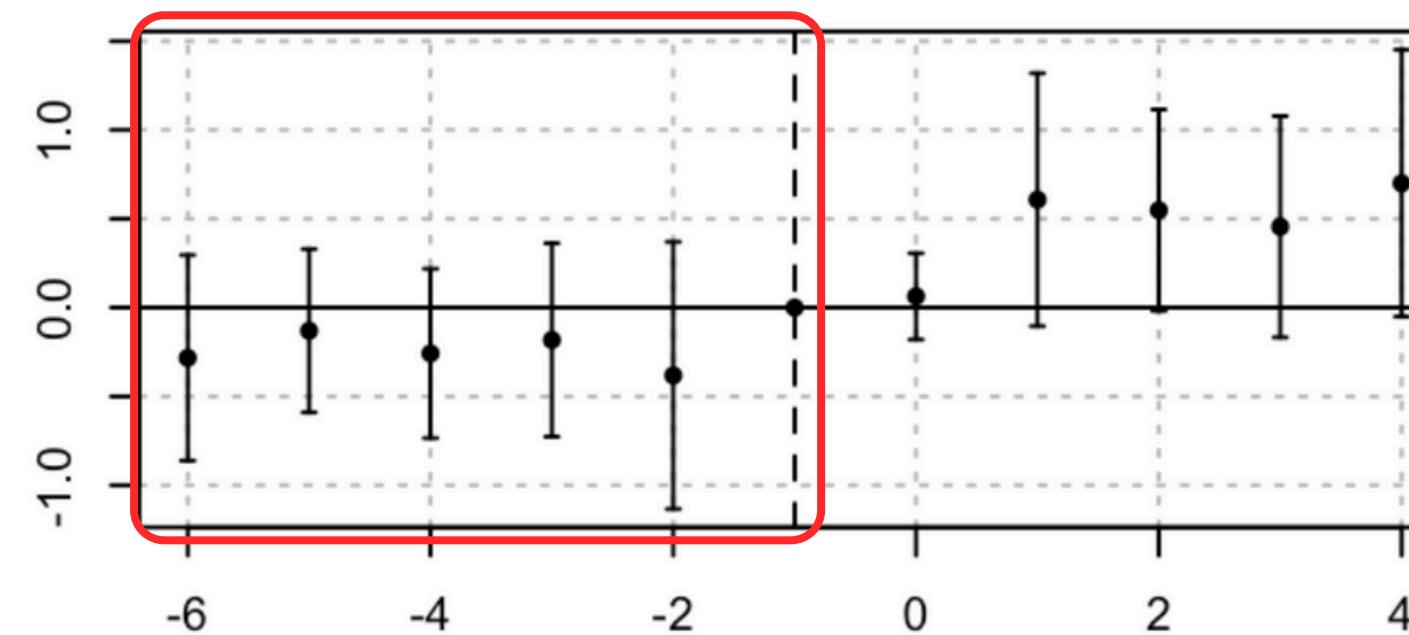
PARALLEL TREND ASSUMPTION

Without the treatment, the control group and treatment group must move in parallel.

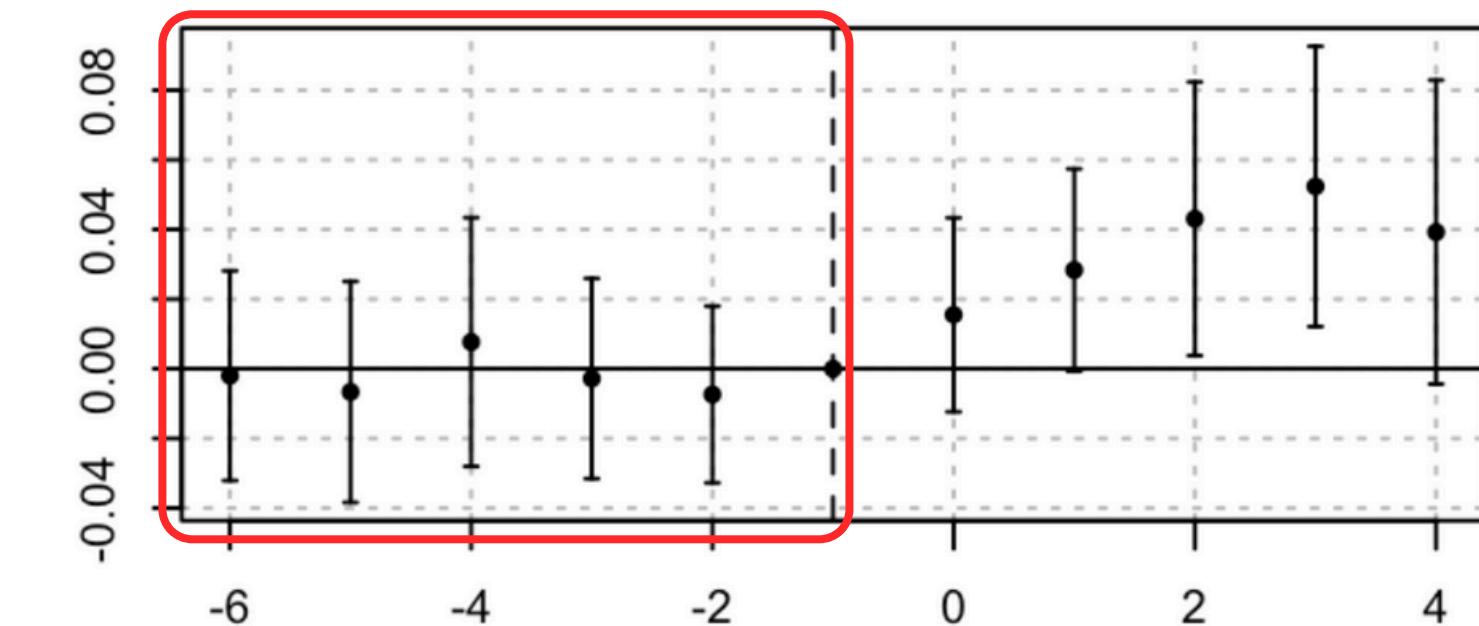


PARALLEL TREND ASSUMPTION

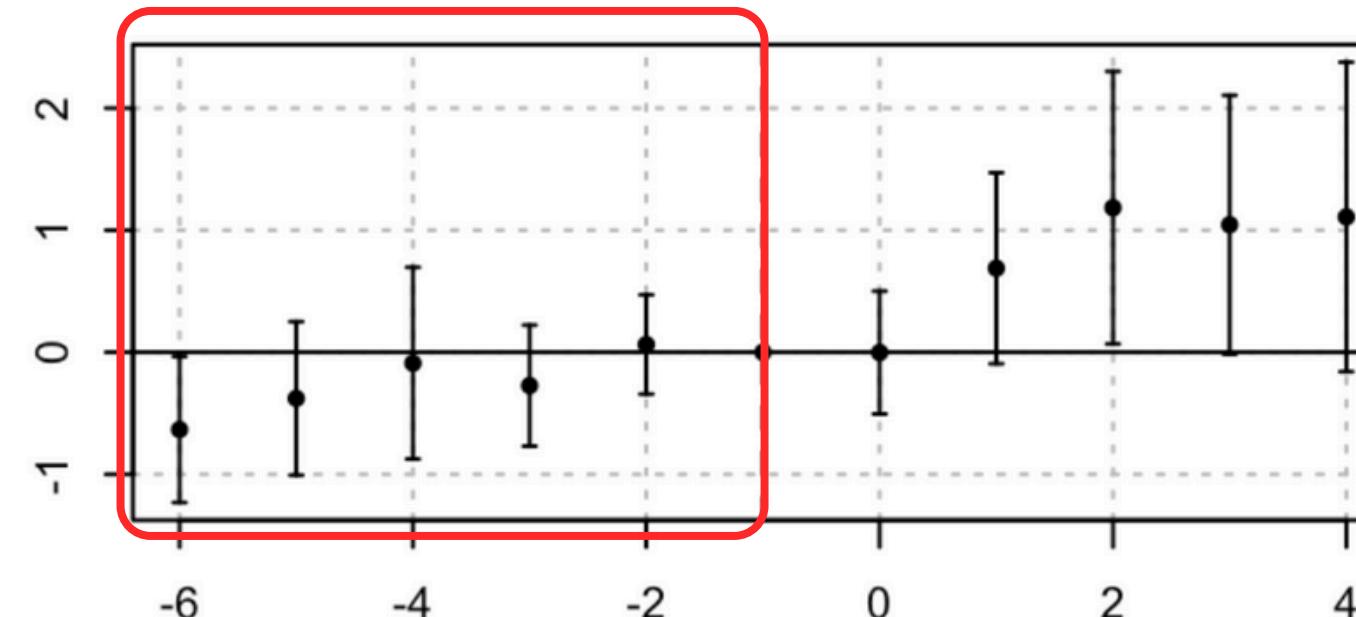
Staggered DiD: AI Investment Impact on ROE



Staggered DiD: AI Investment Impact on ROA



Staggered DiD: AI Investment Impact on Tobin's Q



RESULTS

1. Main Results
2. Robustness Checks:
 - Outliers
 - Alternative Estimator
 - Matching AI firms to non-AI firms



Reject hypothesis 1

Dependent Variables:	ROE		ROA		TOBIN	
Model:	(1)	(2)	(3)	(4)	(5)	(6)
<i>Variables</i>						
Constant	0.2271*** (0.0712)		0.0472** (0.0194)		3.642*** (0.3420)	
6+ years before AI investment	-0.1514* (0.0839)	-0.2577 (0.2978)	0.0299 (0.0221)	-0.0006 (0.0152)	-0.3687 (0.3852)	-0.5588* (0.3068)
5 years before AI investment	-0.1299* (0.0730)	-0.1129 (0.2390)	0.0130 (0.0217)	-0.0060 (0.0164)	-0.4774 (0.3668)	-0.3300 (0.3325)
4 years before AI investment	-0.1047 (0.1790)	-0.2558 (0.2446)	0.0257 (0.0227)	0.0081 (0.0182)	-0.2019 (0.4670)	-0.0347 (0.4168)
3 years before AI investment	0.0219 (0.0974)	-0.1915 (0.2883)	0.0115 (0.0200)	-0.0034 (0.0146)	-0.4115 (0.2733)	-0.2503 (0.2596)
2 years before AI investment	-0.1006 (0.0921)	-0.3746 (0.3743)	-0.0097 (0.0124)	-0.0090 (0.0128)	0.0857 (0.2224)	0.0789 (0.2098)
1 year before AI investment				<i>Omitted</i>		
Year of AI investment	0.4176 (0.2737)	0.0706 (0.1241)	0.0108 (0.0194)	0.0146 (0.0142)	-1.528*** (0.3488)	-0.0067 (0.2554)
1 year after AI investment	0.2026 (0.2688)	0.6081* (0.3658)	0.0191 (0.0155)	0.0267* (0.0148)	0.4579 (0.3974)	0.6726* (0.3983)
2 years after AI investment	0.0630 (0.0998)	0.5425* (0.2905)	0.0224 (0.0181)	0.0413** (0.0201)	0.8848 (0.5691)	1.166** (0.5690)
3 years after AI investment	-0.0730 (0.0918)	0.4435 (0.3172)	0.0382** (0.0157)	0.0500** (0.0204)	0.3900 (0.4961)	0.9748* (0.5402)
4 years after AI investment	0.0930 (0.1537)	0.6912* (0.3809)	0.0431** (0.0214)	0.0365 (0.0221)	0.2171 (0.6363)	1.054 (0.6543)
Firm Size		-0.1537 (0.1052)		-0.0019 (0.0186)		-0.8740* (0.5208)
<i>Fixed-effects</i>						
Firm	No	Yes	No	Yes	No	Yes
Year	No	Yes	No	Yes	No	Yes
<i>Fit statistics</i>						
Observations	1,308	1,308	1,308	1,308	1,308	1,308
R ²	0.00238	0.13048	0.01408	0.58070	0.11764	0.66341
Within R ²		0.00173		0.02711		0.06510

Support hypothesis 2

Dependent Variables:	ROE		ROA		TOBIN	
Model:	(1)	(2)	(3)	(4)	(5)	(6)
<i>Variables</i>						
Constant	0.2271*** (0.0712)		0.0472** (0.0194)		3.642*** (0.3420)	
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3 years after AI investment	-0.0750 (0.0918)	0.4435 (0.3172)	0.0382** (0.0157)	0.0500** (0.0204)	0.3900 (0.4961)	0.9748* (0.5402)
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Year	No	Yes	No	Yes	No	Yes
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Observations	1,308	1,308	1,308	1,308	1,308	1,308
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Within R ²		0.00173		0.02711		0.06510

Reject hypothesis 3

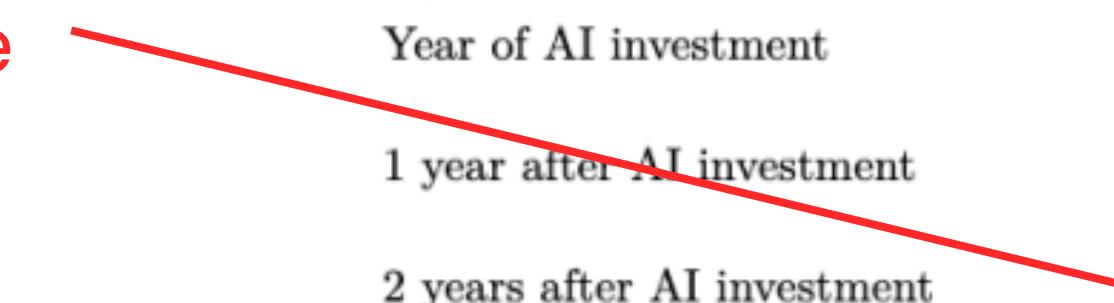
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2 years before AI investment	-0.1006 (0.0921)	-0.3746 (0.3743)	-0.0097 (0.0124)	-0.0090 (0.0128)	0.0857 (0.2224)	0.0789 (0.2098)
1 year before AI investment				<i>Omitted</i>		
Year of AI investment	0.4176 (0.2737)	0.0706 (0.1241)	0.0108 (0.0194)	0.0146 (0.0142)	-1.528*** (0.3488)	-0.0067 (0.2554)
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4 years after AI investment	0.0930 (0.1537)	0.6912* (0.3809)	0.0431** (0.0214)	0.0365 (0.0221)	0.2171 (0.6363)	1.054 (0.6543)
Firm Size		-0.1537 (0.1052)		-0.0019 (0.0186)		-0.8740* (0.5208)
<i>Fixed-effects</i>						
Firm	No	Yes	No	Yes	No	Yes
Year	No	Yes	No	Yes	No	Yes
<i>Fit statistics</i>						
Observations	1,308	1,308	1,308	1,308	1,308	1,308
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Within R ²		0.00173		0.02711		0.06510

Support hypothesis 4

ROBUSTNESS CHECK: OUTLIERS

Rationale	Results might be driven by outliers
Method	Winsorisation at 1 st and 99 th percentile

Major change
in magnitude

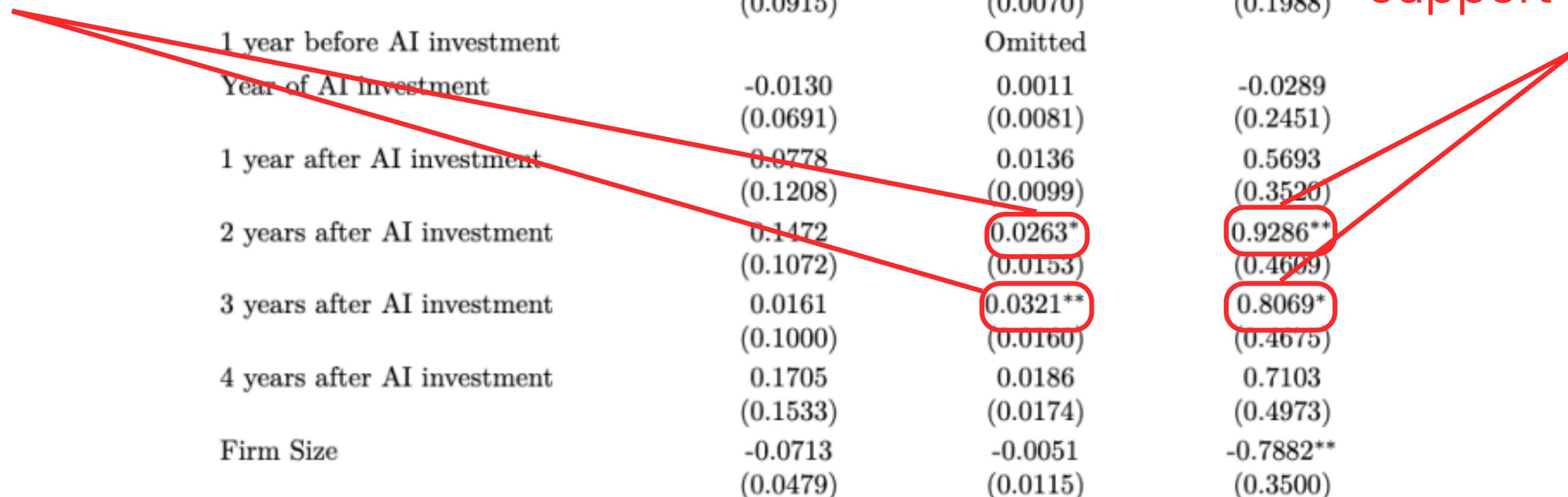


Dependent Variables: Model:	ROE (1)	ROA (2)	TOBIN (3)
<i>Variables</i>			
6+ years before AI investment	-0.2092** (0.0922)	-0.0075 (0.0120)	-0.5447* (0.3076)
5 years before AI investment	-0.1546* (0.0808)	-0.0216* (0.0112)	-0.4529 (0.2792)
4 years before AI investment	-0.0627 (0.1333)	-0.0084 (0.0129)	-0.3038 (0.2629)
3 years before AI investment	-0.0278 (0.0942)	-0.0097 (0.0101)	-0.2714 (0.2515)
2 years before AI investment	-0.1278 (0.0915)	-0.0032 (0.0070)	0.0586 (0.1988)
1 year before AI investment		Omitted	
Year of AI investment	-0.0130 (0.0691)	0.0706 (0.1241)	0.0011 (0.0081)
1 year after AI investment	0.0778 (0.1208)	0.6081* (0.3658)	0.0136 (0.0099)
2 years after AI investment	0.1472 (0.1072)	0.5425* (0.2905)	0.0263* (0.0153)
3 years after AI investment	0.0161 (0.1000)	0.4435 (0.3172)	0.0321** (0.0160)
4 years after AI investment	0.1705 (0.1533)	0.6912* (0.3809)	0.0186 (0.0174)
Firm Size	-0.0713 (0.0479)	-0.0051 (0.0115)	-0.7882** (0.3500)
<i>Fixed-effects</i>			
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	1,308	1,308	1,308
R ²	0.50366	0.60850	0.71863
Within R ²	0.01622	0.02612	0.07459

Dependent Variables: Model:	ROE (1)	ROA (2)	TOBIN (3)
<i>Variables</i>			
6+ years before AI investment	-0.2092** (0.0922)	-0.0075 (0.0120)	-0.5447* (0.3076)
5 years before AI investment	-0.1546* (0.0808)	-0.0216* (0.0112)	-0.4529 (0.2792)
4 years before AI investment	-0.0627 (0.1333)	-0.0084 (0.0129)	-0.3038 (0.2629)
3 years before AI investment	-0.0278 (0.0942)	-0.0097 (0.0101)	-0.2714 (0.2515)
2 years before AI investment	-0.1278 (0.0915)	-0.0032 (0.0070)	0.0586 (0.1988)
1 year before AI investment		Omitted	
Year of AI investment	-0.0130 (0.0691)	0.0011 (0.0081)	-0.0289 (0.2451)
1 year after AI investment	0.0778 (0.1208)	0.0136 (0.0099)	0.5693 (0.3520)
2 years after AI investment	0.1472 (0.1072)	0.0263* (0.0153)	0.9286** (0.4699)
3 years after AI investment	0.0161 (0.1000)	0.0321** (0.0160)	0.8069* (0.4675)
4 years after AI investment	0.1705 (0.1533)	0.0186 (0.0174)	0.7103 (0.4973)
Firm Size	-0.0713 (0.0479)	-0.0051 (0.0115)	-0.7882** (0.3500)
<i>Fixed-effects</i>			
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	1,308	1,308	1,308
R ²	0.50366	0.60850	0.71863
Within R ²	0.01622	0.02612	0.07459

Support hypothesis 2

Support hypothesis 4



ROBUSTNESS CHECK: ALTERNATIVE ESTIMATOR

Rationale	Two way fixed-effect estimator may cause misleading interpretation
Method	Re-estimation using (1) Callaway & Sant'Anna's estimator and (2) Sun Abraham's estimator

CALLAWAY & SANT'ANNA'S ESTIMATOR

No significant coefficients

DV: Model:	ROE (1)	ROA (2)	Tobin's Q (3)
<i>Variables</i>			
9 years before AI investment	0.0138 (0.0454)	0.0153 (0.0070)	0.3023 (0.1507)
8 years before AI investment	0.0691 (0.0831)	-0.0304 (0.0239)	0.0223 (0.4184)
7 years before AI investment	-0.2996 (0.3035)	0.0279 (0.0520)	0.0980 (0.1891)
6 years before AI investment	-0.9119 (1.4997)	0.0084 (0.0301)	-0.5093 (0.3499)
5 years before AI investment	0.4844 (0.7108)	-0.0044 (0.0156)	0.2127 (0.3330)
4 years before AI investment	-0.3419 (0.3827)	0.0089 (0.0195)	0.1327 (0.2131)
3 years before AI investment	0.4617 (0.7124)	-0.0135 (0.0178)	-0.2119 (0.4695)
2 years before AI investment	-0.1924 (0.3319)	0.0072 (0.0104)	0.4618 (0.2616)
1 year before AI investment	0.3649 (0.6650)	-0.0146 (0.0200)	-0.0468 (0.2444)
Year of AI investment	0.0690 (0.1622)	0.0272 (0.0165)	-0.0620 (0.3419)
1 year after AI investment	0.7478 (0.4914)	0.0449 (0.0198)	0.8356 (0.5994)
2 years after AI investment	0.8929 (0.7316)	0.0448 (0.0234)	1.9761 (1.0357)
3 years after AI investment	2.4932 (2.7366)	0.0409 (0.0177)	1.0736 (0.5315)
4 years after AI investment	3.2484 (3.2780)	0.0342 (0.0233)	0.4710 (0.5207)
5 years after AI investment	0.5268 (0.4575)	0.0400 (0.0268)	0.7530 (0.9109)
<i>Fit statistics</i>			
Observations	1,294	1,294	1,294

SUN & ABRAHAM'S ESTIMATOR

Minor violations of parallel trend

Dependent Variables: Model:	ROE (1)	ROA (2)	TOBIN (3)
<i>Variables</i>			
10 years before AI investment	0.0730 (0.1130)	0.0729*** (0.0190)	0.5505 (0.5343)
9 years before AI investment	0.0082 (0.1805)	0.0202 (0.0259)	-1.264** (0.5751)
8 years before AI investment	-0.0400 (0.1803)	-0.0034 (0.0155)	-0.9577** (0.4608)
7 years before AI investment	-0.3300 (0.2189)	-0.0064 (0.0229)	-0.6857* (0.4097)
6 years before AI investment	-0.4169 (0.7834)	-0.0009 (0.0151)	-0.6561** (0.3003)
5 years before AI investment	0.0693 (0.3077)	-0.0079 (0.0147)	-0.5034 (0.3234)
4 years before AI investment	-0.2322 (0.2131)	0.0070 (0.0171)	-0.2218 (0.4040)
3 years before AI investment	-0.2544 (0.4381)	-0.0038 (0.0133)	-0.4168* (0.2507)
2 years before AI investment	-0.5606 (0.6052)	-0.0081 (0.0119)	0.0558 (0.2021)
1 year before AI investment		Omitted	
Year of AI investment	0.1163 (0.1200)	0.0144 (0.0135)	-0.1780 (0.2438)
1 year after AI investment	0.8350* (0.4660)	0.0263* (0.0149)	0.5275 (0.3747)
2 years after AI investment	0.8860* (0.5315)	0.0408* (0.0215)	1.180** (0.5307)
3 years after AI investment	0.8352 (0.6295)	0.0496** (0.0219)	0.9092* (0.4620)
4 years after AI investment	1.287 (0.7861)	0.0260 (0.0222)	0.3918 (0.4537)
5 years after AI investment	0.4449 (0.3969)	0.0306 (0.0269)	0.9732 (0.7847)
Firm Size	-0.1530 (0.0983)	-0.0000 (0.0186)	-0.8862* (0.5068)
<i>Fixed-effects</i>			
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	1,308	1,308	1,308
R ²	0.14042	0.60624	0.68402
Within R ²	0.01315	0.08636	0.12233

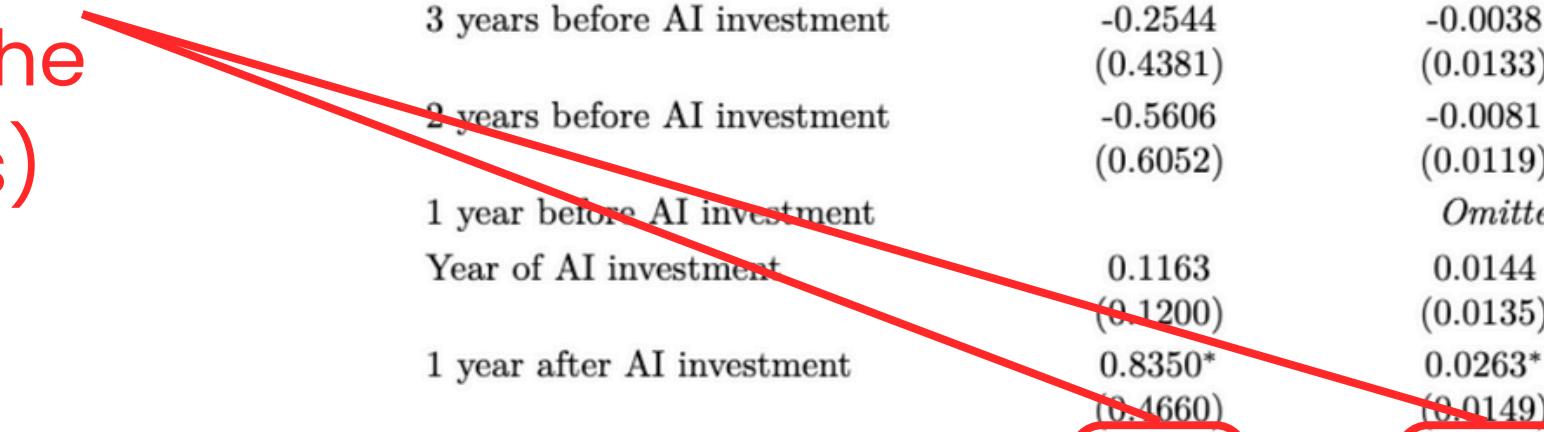
SUN & ABRAHAM'S ESTIMATOR

Reject hypothesis 1
 (align with the main results)

Dependent Variables: Model:	ROE (1)	ROA (2)	TOBIN (3)
<i>Variables</i>			
10 years before AI investment	0.0730 (0.1130)	0.0729*** (0.0190)	0.5505 (0.5343)
9 years before AI investment	0.0082 (0.1805)	0.0202 (0.0259)	-1.264** (0.5751)
8 years before AI investment	-0.0400 (0.1803)	-0.0034 (0.0155)	-0.9577** (0.4608)
7 years before AI investment	-0.3300 (0.2189)	-0.0064 (0.0229)	-0.6857* (0.4097)
6 years before AI investment	-0.4169 (0.7834)	-0.0009 (0.0151)	-0.6561** (0.3003)
5 years before AI investment	0.0693 (0.3077)	-0.0079 (0.0147)	-0.5034 (0.3234)
4 years before AI investment	-0.2322 (0.2131)	0.0070 (0.0171)	-0.2218 (0.4040)
3 years before AI investment	-0.2544 (0.4381)	-0.0038 (0.0133)	-0.4168* (0.2507)
2 years before AI investment	-0.5606 (0.6052)	-0.0081 (0.0119)	0.0558 (0.2021)
1 year before AI investment		<i>Omitted</i>	
Year of AI investment	0.1163 (0.1200)	0.0144 (0.0135)	-0.1780 (0.2438)
1 year after AI investment	0.8350* (0.4660)	0.0263* (0.0149)	0.5275 (0.3747)
2 years after AI investment	0.8860* (0.5315)	0.0408* (0.0215)	1.180** (0.5307)
3 years after AI investment	0.8352 (0.6295)	0.0496** (0.0219)	0.9092* (0.4620)
4 years after AI investment	1.287 (0.7861)	0.0260 (0.0222)	0.3918 (0.4537)
5 years after AI investment	0.4449 (0.3969)	0.0306 (0.0269)	0.9732 (0.7847)
Firm Size	-0.1530 (0.0983)	-0.0000 (0.0186)	-0.8862* (0.5068)
<i>Fixed-effects</i>			
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	1,308	1,308	1,308
R ²	0.14042	0.60624	0.68402
Within R ²	0.01315	0.08636	0.12233

SUN & ABRAHAM'S ESTIMATOR

Partially support hypothesis 2
(align with the main results)

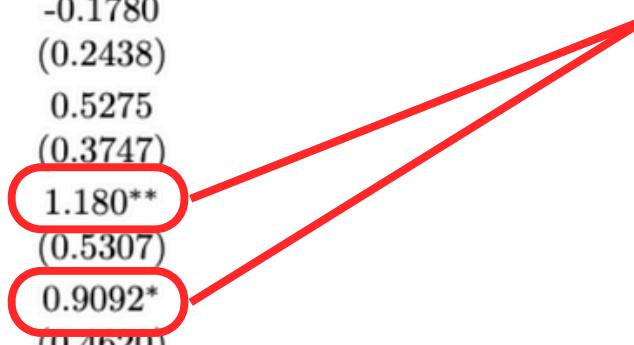


Dependent Variables: Model:	ROE (1)	ROA (2)	TOBIN (3)
<i>Variables</i>			
10 years before AI investment	0.0730 (0.1130)	0.0729*** (0.0190)	0.5505 (0.5343)
9 years before AI investment	0.0082 (0.1805)	0.0202 (0.0259)	-1.264** (0.5751)
8 years before AI investment	-0.0400 (0.1803)	-0.0034 (0.0155)	-0.9577** (0.4608)
7 years before AI investment	-0.3300 (0.2189)	-0.0064 (0.0229)	-0.6857* (0.4097)
6 years before AI investment	-0.4169 (0.7834)	-0.0009 (0.0151)	-0.6561** (0.3003)
5 years before AI investment	0.0693 (0.3077)	-0.0079 (0.0147)	-0.5034 (0.3234)
4 years before AI investment	-0.2322 (0.2131)	0.0070 (0.0171)	-0.2218 (0.4040)
3 years before AI investment	-0.2544 (0.4381)	-0.0038 (0.0133)	-0.4168* (0.2507)
2 years before AI investment	-0.5606 (0.6052)	-0.0081 (0.0119)	0.0558 (0.2021)
1 year before AI investment		<i>Omitted</i>	
Year of AI investment	0.1163 (0.1200)	0.0144 (0.0135)	-0.1780 (0.2438)
1 year after AI investment	0.8350* (0.4660)	0.0263* (0.0149)	0.5275 (0.3747)
2 years after AI investment	0.8860* (0.5315)	0.0408* (0.0215)	1.180** (0.5307)
3 years after AI investment	0.8352 (0.6295)	0.0496** (0.0219)	0.9092* (0.4620)
4 years after AI investment	1.287 (0.7861)	0.0260 (0.0222)	0.3918 (0.4537)
5 years after AI investment	0.4449 (0.3969)	0.0306 (0.0269)	0.9732 (0.7847)
Firm Size	-0.1530 (0.0983)	-0.0000 (0.0186)	-0.8862* (0.5068)
<i>Fixed-effects</i>			
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	1,308	1,308	1,308
R ²	0.14042	0.60624	0.68402
Within R ²	0.01315	0.08636	0.12233

SUN & ABRAHAM'S ESTIMATOR

Dependent Variables: Model:	ROE (1)	ROA (2)	TOBIN (3)
<i>Variables</i>			
10 years before AI investment	0.0730 (0.1130)	0.0729*** (0.0190)	0.5505 (0.5343)
9 years before AI investment	0.0082 (0.1805)	0.0202 (0.0259)	-1.264** (0.5751)
8 years before AI investment	-0.0400 (0.1803)	-0.0034 (0.0155)	-0.9577** (0.4608)
7 years before AI investment	-0.3300 (0.2189)	-0.0064 (0.0229)	-0.6857* (0.4097)
6 years before AI investment	-0.4169 (0.7834)	-0.0009 (0.0151)	-0.6561** (0.3003)
5 years before AI investment	0.0693 (0.3077)	-0.0079 (0.0147)	-0.5034 (0.3234)
4 years before AI investment	-0.2322 (0.2131)	0.0070 (0.0171)	-0.2218 (0.4040)
3 years before AI investment	-0.2544 (0.4381)	-0.0038 (0.0133)	-0.4168* (0.2507)
2 years before AI investment	-0.5606 (0.6052)	-0.0081 (0.0119)	0.0558 (0.2021)
1 year before AI investment		<i>Omitted</i>	
Year of AI investment	0.1163 (0.1200)	0.0144 (0.0135)	-0.1780 (0.2438)
1 year after AI investment	0.8350* (0.4660)	0.0263* (0.0149)	0.5275 (0.3747)
2 years after AI investment	0.8860* (0.5315)	0.0408* (0.0215)	1.180** (0.5307)
3 years after AI investment	0.8352 (0.6295)	0.0496** (0.0219)	0.9092* (0.4620)
4 years after AI investment	1.287 (0.7861)	0.0260 (0.0222)	0.3918 (0.4537)
5 years after AI investment	0.4449 (0.3969)	0.0306 (0.0269)	0.9732 (0.7847)
Firm Size	-0.1530 (0.0983)	-0.0000 (0.0186)	-0.8862* (0.5068)
<i>Fixed-effects</i>			
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	1,308	1,308	1,308
R ²	0.14042	0.60624	0.68402
Within R ²	0.01315	0.08636	0.12233

Partially support hypothesis 4 (align with the main results)



ROBUSTNESS CHECK: MATCHING

Rationale	Random selection might introduce selection bias
Method	Optimal full matching based on firm sizes and industries

	Treatment Group	Control Group
Number of Units	61	145
Mean Differences		
Firm Size	9.67	9.47

Dependent Variables: Model:	ROE (1)	ROA (2)	TOBIN (3)
<i>Variables</i>			
6+ years before AI investment	0.1296 (0.3931)	0.0144 (0.0150)	0.2066 (0.3660)
5 years before AI investment	0.1599 (0.3668)	0.0054 (0.0171)	0.2177 (0.4007)
4 years before AI investment	0.1204 (0.3101)	0.0136 (0.0182)	0.4066 (0.4820)
3 years before AI investment	-0.1121 (0.2707)	0.0010 (0.0141)	0.0746 (0.2891)
2 years before AI investment	0.0186 (0.1937)	-0.0058 (0.0124)	0.2530 (0.2133)
1 year before AI investment		<i>Omitted</i>	
Year of AI investment	-0.2614 (0.2573)	0.0099 (0.0145)	-0.1397 (0.2421)
1 year after AI investment	-0.0337 (0.4043)	0.0203 (0.0156)	0.3595 (0.3801)
2 years after AI investment	0.3048 (0.3468)	0.0337* (0.0201)	0.6661 (0.5366)
3 years after AI investment	0.2642 (0.3910)	0.0423** (0.0198)	0.4400 (0.4780)
4 years after AI investment	0.4892 (0.4743)	0.0268 (0.0200)	0.5081 (0.5815)
Firm Size	-0.5422 (0.7857)	-0.0052 (0.0130)	-0.9387** (0.3988)
<i>Fixed-effects</i>			
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	2,172	2,172	2,172
R ²	0.09521	0.58091	0.69128
Within R ²	0.00066	0.01280	0.04867

Support
hypothesis 2
(align with the
main results)

DISCUSSION

1. Interpretation
2. Limitations



	Hypothesis 1	Hypothesis 2	Hypothesis 3	Hypothesis 4
Main Models	Rejected	Supported	Rejected	Supported
Robustness Check: Outliers	Not significant	Supported	Not significant	Supported
Robustness Check: Alternative Estimator	Rejected	Supported	Not significant	Supported
Robustness Check: Matching	Not significant	Supported	Not significant	Not significant

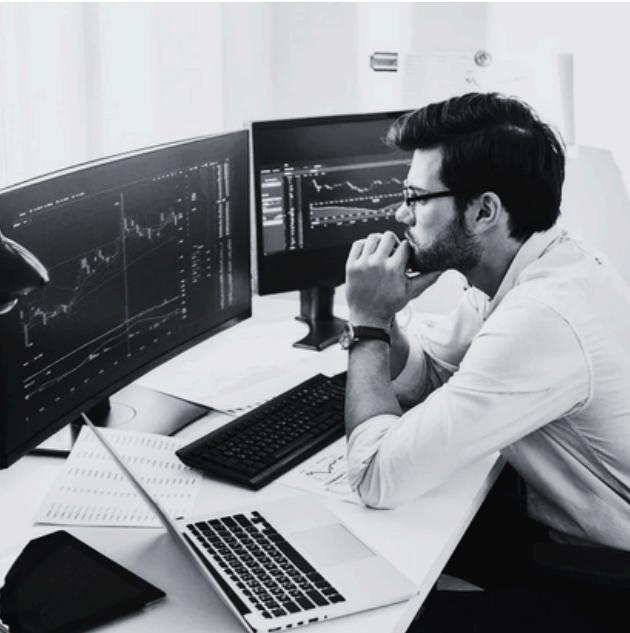
KEY POINTS

1. AI investment pays off **since year 1** after the investment year, different from previous waves of technology investment.
2. Firm performance and market value of AI investing firms are **positive** in both **short-term** and **long-term**.
3. The positive effects appear to be the **strongest** at year **2** and year **3** post investment.

LIMITATIONS

- 1.Timing proxy might not accurately reflect the true investment period.
- 2.Small sample size.
- 3.Low significance level at some points.
- 4.Not explore the differences in effect across firm sizes and industries.
- 5.Not control industry and investment costs.

CONCLUSION





**THANK
YOU**