Firm-Level Shock Exposures, Stock Returns, and Real Outcomes: A Text-Analytic Approach

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BdI-EIEF

Outline

1. Introduction

2. Constructing Firm-Level Exposures with Text

3. Is Text Informative about Asset Price Response?

4. Shock Exposures and Real Outcomes

5. Shock Exposures and Distribution of Firm-Level Outcomes

Introduction

Firm heterogeneity is a widely accepted empirical phenomenon (Davis and Haltiwanger 1992, 1999) and increasingly incorporated into macro models (Hopenhayn 1992).

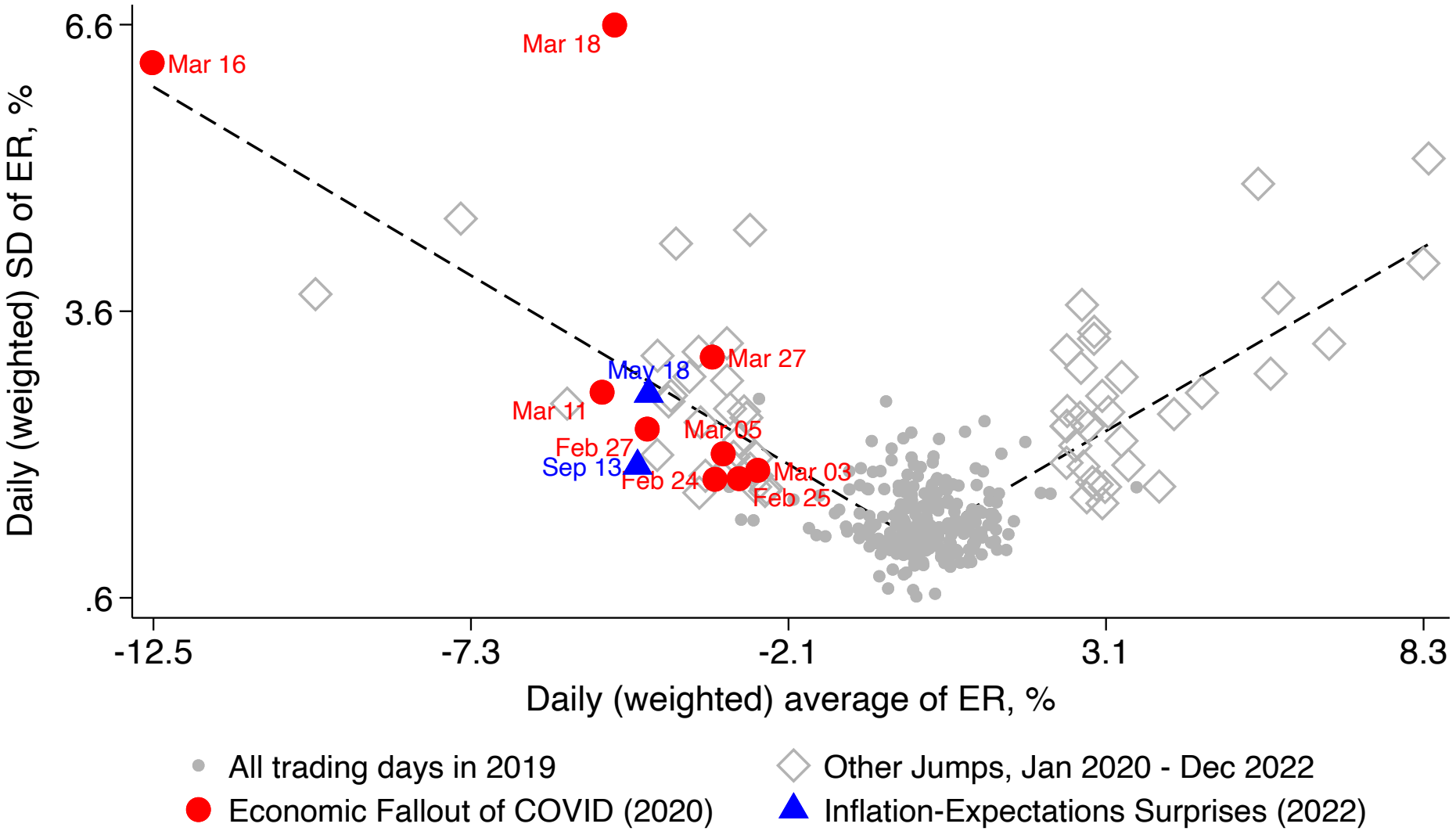
How such heterogeneity arises is less clear.

We assess the extent to which macro shocks interact with firm characteristics to generate heterogeneity.

Limited evidence on heterogeneous transmission of macro shocks (Ottonello and Winberry 2020, Gürkaynak et. al. 2022).

Important identification problem of isolating the contribution of macro shocks to firm-level real outcomes.

Evidence for Jump Dates since 2020



Limitations of Asset Price Responses Overcome with Text

Heterogeneity in asset price response $\neq$ heterogeneity in real outcomes.

No accounting of drivers of heterogeneous responses.

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To address these, we use the Risk Factors discussions of 10-K filings.

RF texts detail sources of risk/uncertainty in future earnings; exhaustive due to their legal status.

Full set of RF corpora downloaded for the 2015-2019 time period. We use one compiled report by firm.

Matched to stock return data to form sample of ca. 2,000 firms.

Example: linking price reactions, text, and outcomes

Company	NAICS	Abnormal Return[1]
NetApp Inc	3341[2]	4.34%
Scientific Games	3341	-4.92%
Domino's Pizza	722511[3]	-0.04%
Ruth's Hospitality Group	722511	-9.28%

Key points:

1. Sector membership imperfect proxy for exposure.

[1] Average abnormal return on "Economic Fallout of COVID" dates as defined above
[2] Computer and Peripheral Equipment Manufacturing
[3] Full-Service Restaurants

Example: linking price reactions, text, and outcomes

Company	NAICS	Abnormal Return[1]	Revenue Growth 2018Q3-2020Q3
NetApp Inc	3341[2]	4.34%	-6.9%
Scientific Games	3341	-4.92%	-64.2%
Domino's Pizza	722511[3]	-0.04%	20.8%
Ruth's Hospitality Group	722511	-9.28%	-44.5%

Key points:

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2. Link between abnormal returns and real outcomes.
3. Different outcomes linked to pre-pandemic business practices, **which can be informed by text from 10Ks!**

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Jump Dates

2020 jumps		2021 jumps	2022 jumps	
02/24	03/17	02/25	03/07	05/27
02/25	03/18	03/01	03/09	06/13
02/27	03/23		03/16	06/16
03/02	03/24		04/22	06/24
03/03	03/26		04/26	07/19
03/05	03/27		04/29	09/13
03/10	03/30		05/05	10/03
03/11	04/01		05/09	10/04
03/16	04/06		05/13	10/07
04/08	04/14		05/18	10/17
04/17	04/21		11/10	12/15
04/29	05/01			
05/18	06/05			
06/24	09/08			
09/23	10/28			

Table: Unclassified Dates Pandemic News Dates Inflation News Dates

Multinomial Inverse Regression

Procedure from Taddy (2013) and applied in Gentzkow et. al. (2019).

For jump date d and each term v, estimate Poisson regression

$$\log \mathbb{E}[\, c_{i,v} \,] = \alpha_v^d + \beta_v^d \mathrm{AbnRet}_i^d + \left(\boldsymbol{\gamma}_v^d\right)^T \mathbf{controls}_i^{y(d)}$$

- $c_{i,v}$ is count of term v in firm i's *RF* filings (14K unique terms).
- AbnRet_i^d is firm-level abnormal return.
- $\mathbf{controls}_i^{y(d)}$ includes NAICS2 effects; leverage; market cap.

Run for each jump date separately and for average return on P(andemic) and I(nflation) days.

Ranking of Terms for Pandemic Dates

Bottom Terms		Top Terms	
Term	**Value**	**Term**	**Value**
hotel	-33549.80	game	19595.17
unitholder	-18019.33	product_candidate	18475.38
general_partner	-14038.83	client	17157.35
gaming	-11840.90	drug_candidate	12859.84
restaurant	-11830.94	clinical_trial	11963.56
reit	-10605.63	cellular	9029.67
tenant	-10177.66	subscription	7706.73
satellite	-9343.81	solution	7571.91
crude_oil	-9220.05	patient	6222.35
common_unit	-9087.59	student	6058.91
hotel_property	-8337.83	platform	5430.79
refinery	-7749.49	drug	5120.28
travel	-6931.05	collaborator	4641.59
franchisee	-6722.54	datum_center	4317.81
trs	-6657.09	celgene	4266.25

Table: **Influential Terms for Pandemic Jumps**. The ranking of term v is based on its tf-idf score multiplied by $\hat{\beta}_v^P$.

Ranking of Terms for Inflation Dates

Bottom Terms		Top Terms	
Term	**Value**	**Term**	**Value**
tenant	-15810.95	hotel	31389.56
student	-9557.59	natural_gas	9899.49
operating_partnership	-7896.48	gaming	8074.73
reit	-7610.02	crude_oil	8016.95
real_estate	-7081.87	hotel_property	7193.75
homebuilding	-7078.13	aircraft	7111.44
the_company	-7038.95	solar	7065.24
product_candidate	-6580.21	pipeline	6868.64
home	-6515.21	oil	6852.39
client	-6057.50	ferc	6846.26
property	-5597.77	unitholder	6420.11
cellular	-5487.07	drilling	6027.62
fcc	-5200.31	ngl	5968.09
clinical_trial	-4671.19	fuel	5235.03
wireless	-4270.11	semiconductor	5142.39

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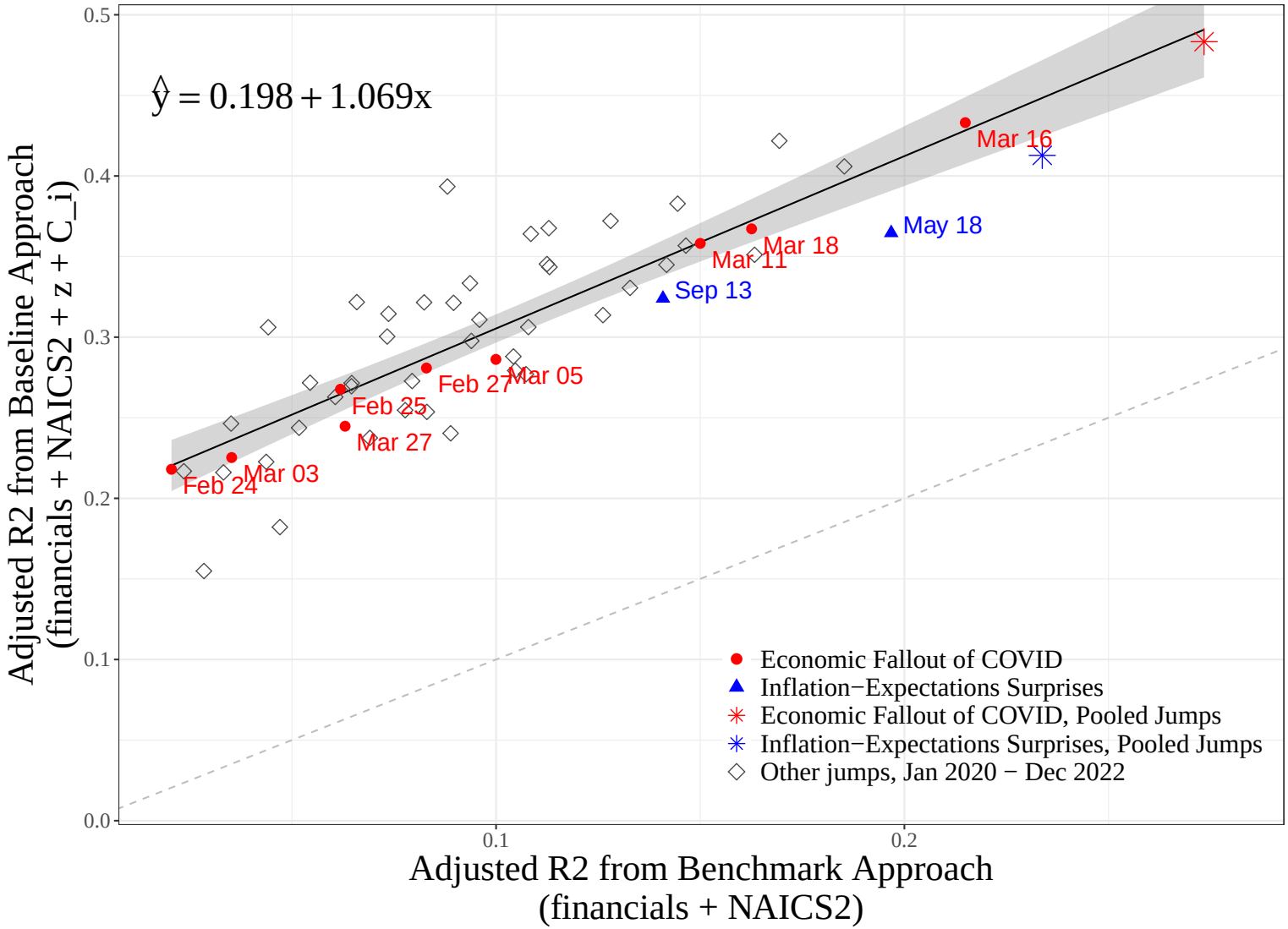

Figure: Adjusted R^2 from regressing abnormal returns from jump dates on controls for NAICS2 sector, leverage, and size (x-axis) and additionally including text-based shock exposures and controls for text length (y-axis).

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Quantifying Firm-Level Shock Transmission

Main real outcome of interest is quarterly revenue growth

$$\Delta \text{rev}_{it} = \log(\text{rev}_{i,t}) - \log(\text{rev}_{i,t-12}) \quad t = 2018Q1, \ldots, 2022Q4$$

Balanced panel built from COMPUSTAT $\approx$ 1,000 firms.

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Balanced panel built from COMPUSTAT $\approx$ 1,000 firms.

Heterogeneous shock exposure $\Longrightarrow$ heterogeneous real outcomes?

Answer depends on measure of firm-level shock exposure.

We estimate firm-level transmission based on:

1. Abnormal returns (in line with macro literature)
2. Text exposures + part of abnormal return unexplained by text

Baseline Regression Model

$$\Delta \text{rev}_{it} = I_i + I_{s(i),t} + \sum_{t=19Q1}^{22Q4} I_t \alpha_t' \mathbf{e}_i + \sum_{t=18Q1}^{18Q4} I_t \beta' \mathbf{controls}_{it} + \sum_{t=19Q1}^{22Q4} I_t \beta_t' \mathbf{controls}_{it} + \epsilon_{it}$$

- Firm fixed effects

Baseline Regression Model

$$\Delta \text{rev}_{it} = l_i + l_{s(i),t} + \sum_{t=19Q1}^{22Q4} l_t \alpha_t' \mathbf{e}_i + \sum_{t=18Q1}^{18Q4} l_t \beta' \mathbf{controls}_{it} + \sum_{t=19Q1}^{22Q4} l_t \beta_t' \mathbf{controls}_{it} + \epsilon_{it}$$

- Firm fixed effects
- Shock exposure measures

Baseline Regression Model

$$\Delta \text{rev}_{it} = I_i + I_{s(i),t} + \sum_{t=19Q1}^{22Q4} I_t \boldsymbol{\alpha_t}' \mathbf{e}_i + \sum_{t=18Q1}^{18Q4} I_t \boldsymbol{\beta}' \mathbf{controls}_{it} + \sum_{t=19Q1}^{22Q4} I_t \boldsymbol{\beta}_t' \mathbf{controls}_{it} + \epsilon_{it}$$

- Firm fixed effects.
- Shock exposure measures.
- Key coefficients of interest $\longrightarrow$

  Does variation in exposure shift revenue growth relative to baseline?

First spec: $\mathbf{e}_i = \left(\mathrm{AbnRet}_i^P, \mathrm{AbnRet}_i^I\right)$

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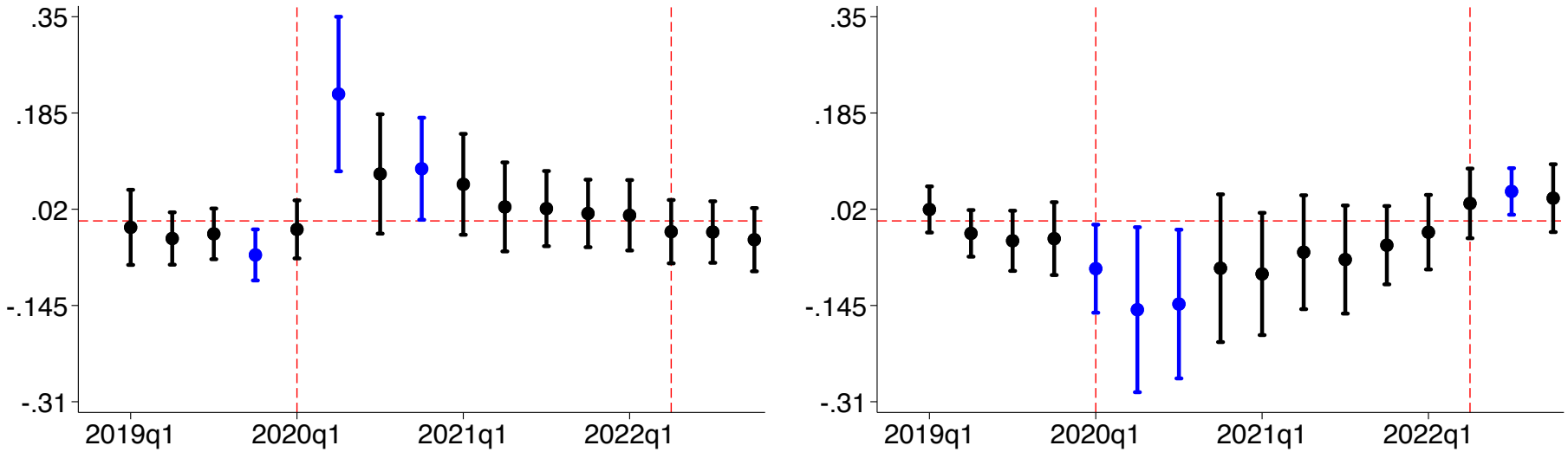

Figure: Revenue Growth and **Raw-Return** Exposures

Second spec: $\mathbf{e}_i = \left(z_i^P, \hat{\varepsilon}_i^P, z_i^I, \hat{\varepsilon}_i^I\right)$

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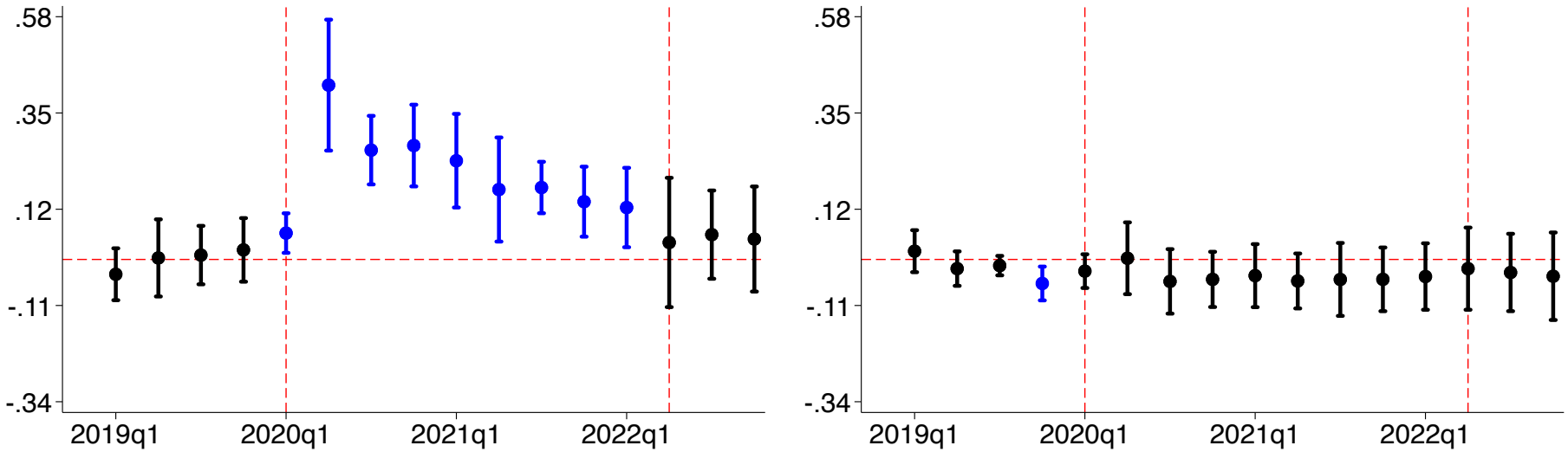

Text Exposure **Residual Exposure**

Figure: Revenue Growth and (Decomposed) **Pandemic** Exposures

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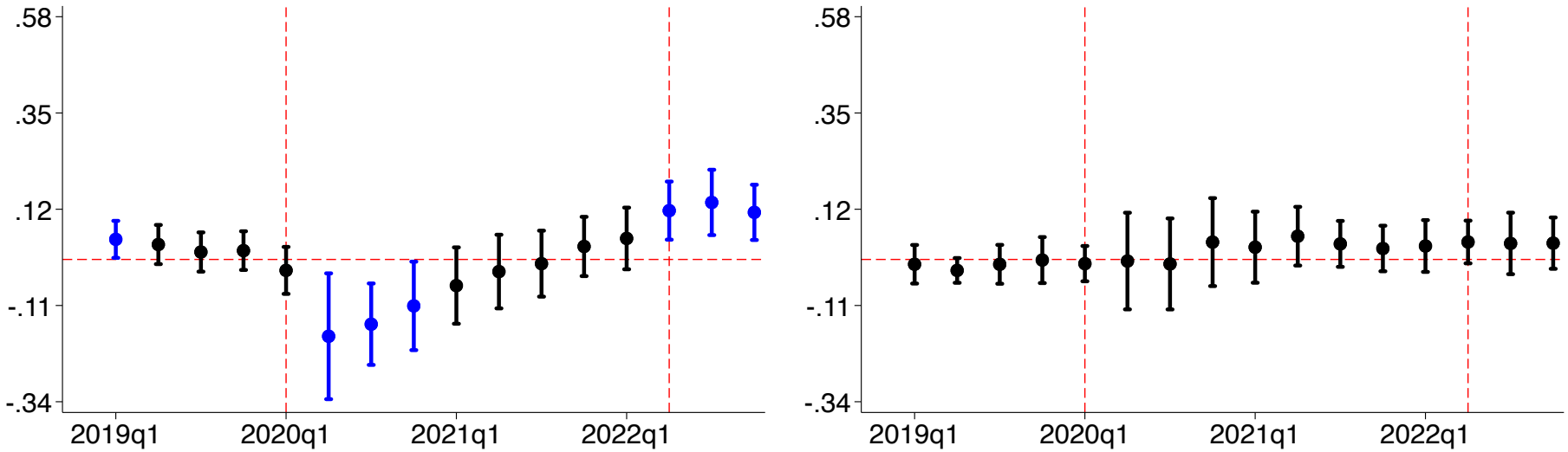

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Figure: Revenue Growth and (Decomposed) **Inflation** Exposures

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Shock Exposures Account for Much of Realized Dispersion

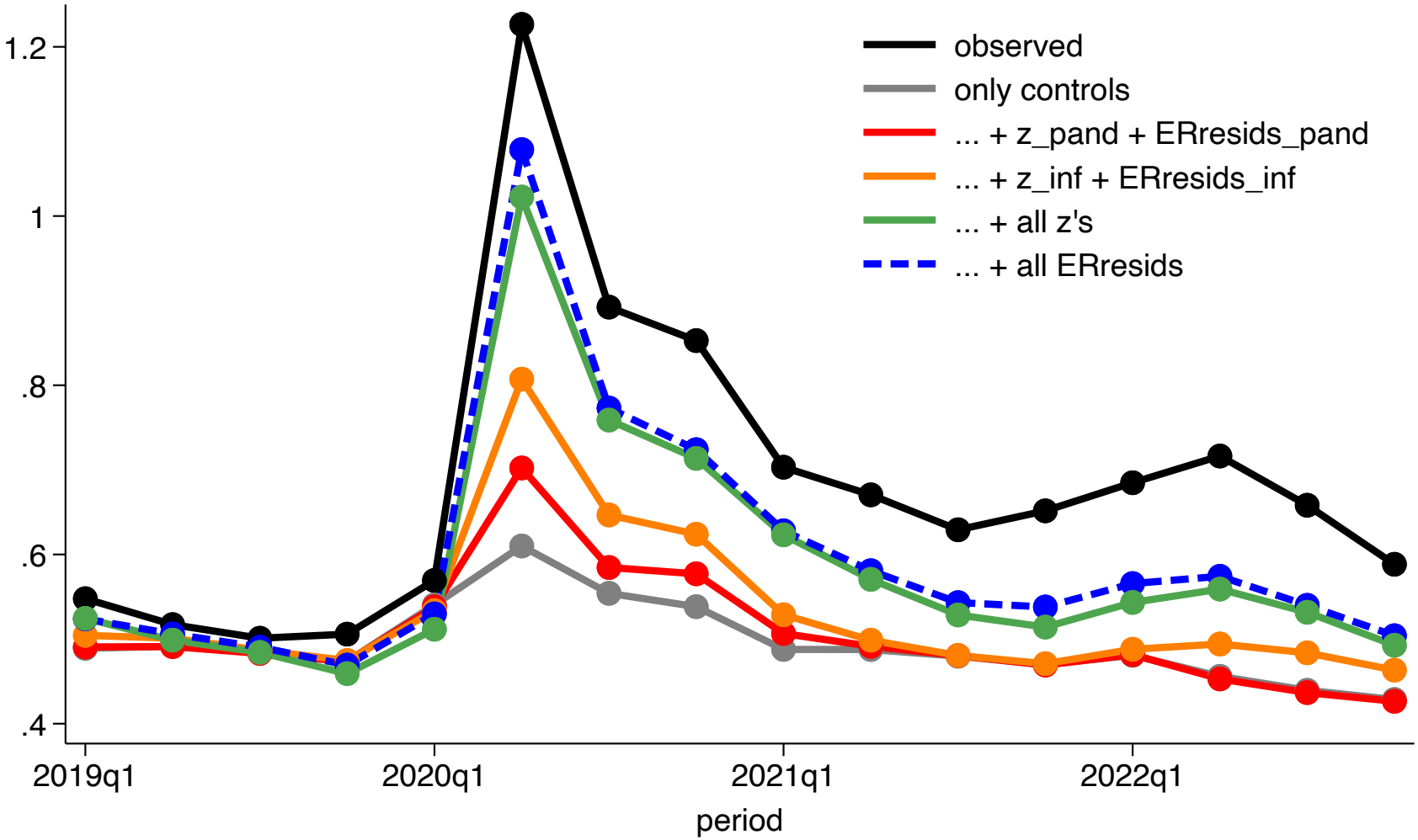
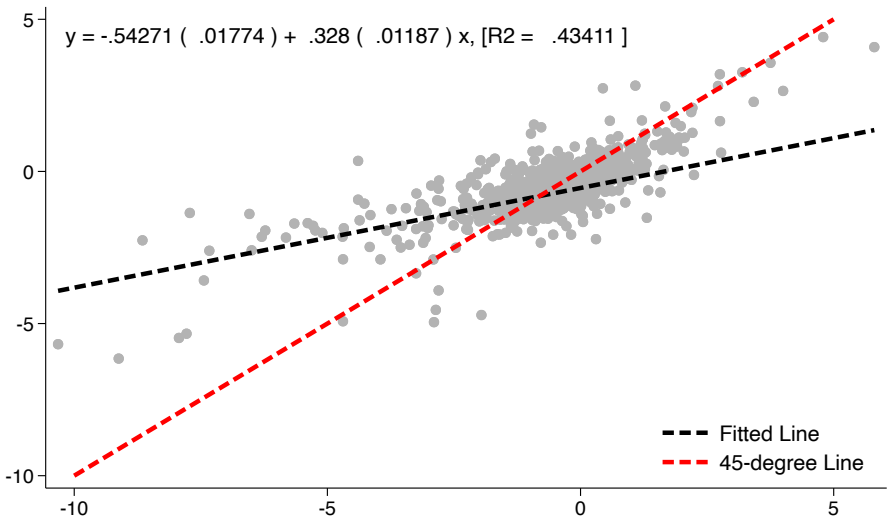
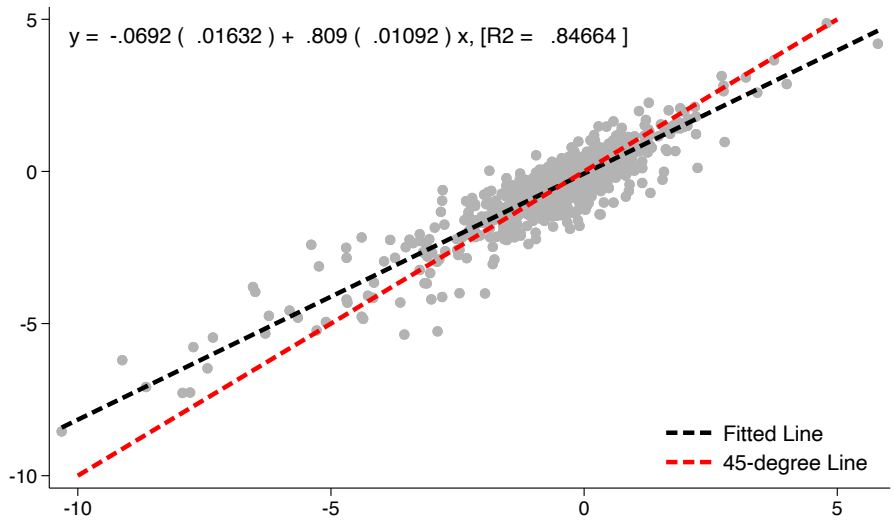


Figure: Realized and Fitted Standard Deviation of Revenue Growth

Distribution of 2020Q2 Revenue Growth



Firm FE + Controls



+ All Text Exposures

Figure: Realized and Predicted Revenue Growth in 2020Q2