

Investment Plans, Uncertainty, and Misallocation

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Abstract

We use data on firms' expectations and planned capital expenditures to show planned investment (i) is partially flexible to real-time shocks, and (ii) is a strong predictor of actual investment, with higher statistical importance than expected sales. To explain these facts, we develop an investment model with endogenous learning and partially flexible investment plans. Our calibrated model shows managers actively use both strategies, but prefer better information over ex-post adjustments. Moreover, our results suggest that capital misallocation from uncertainty is much smaller than in a standard firm dynamics model. Finally, our model predicts countercyclical uncertainty via endogenous fluctuations in returns to learning.

Summary

Background: The ability to formulate good investment plans ex-ante, and/or to adjust investment spending ex-post, determines the importance of profitability uncertainty for capital misallocation. High degree of learning and/or investment spending adjustments would lower impact of uncertainty vis-à-vis capital misallocation.

Research question: How good are investment plans, how flexible are they, and how much does uncertainty contribute to capital misallocation?

What we do:

- Utilize unique firm-level data from Japan that contains (a) expectations and realized quantitative values of sales, profits, and investment and (b) balance sheet items, to establish key facts about the relationship between investment plans and realized investment.
- Construct an investment model featuring learning and partially flexible investment plans to explain key facts above.
- Utilize model framework to decompose contribution of learning and ex-post investment plan adjustment to ameliorating impact of uncertainty

Main findings:

- Investment plans are partially flexible, suggesting role for ex-post adjustments in reducing capital misallocation arising from uncertainty.
- Investment plans capture both the expectations of future profitability, and the precision of these expectations. As a result, investment plans have stronger predictive power for actual investment compared to expected TFP.
- Returns to learning is increasing in firm productivity.
 - Measures of aggregate (average) uncertainty masks large heterogeneity in firm-level uncertainty. Ignoring underlying endogenous heterogeneity greatly overstates capital misallocation due to uncertainty.
 - Countercyclical aggregate uncertainty can partly be explained by optimal choice of learning by firms in different states of the world.

Key Stylized Facts of Investment Plans

Stylized Fact 1: Investment plans are strong predictors of actual investment, often more so than measures of expected profitability.

- We run a horse race between investment plans and various measures of expected firm performance in forecasting actual investment.

Panel B: Investment Plans and Expected Firm Performance						
Dependent Variable:	i/k					
	$\log(\mathbb{E}[\text{Sales}]/k)$		$\log(\mathbb{E}[VA]/k)$		$\log(\mathbb{E}[z])$	
Performance Measure:	(1)	(2)	(3)	(4)	(5)	(6)
Expected Performance	2.691*** (0.228)	0.937*** (0.142)	2.301*** (0.205)	0.637*** (0.050)	0.872*** (0.150)	0.182* (0.096)
i^p		0.634*** (0.050)		0.771*** (0.135)		0.648*** (0.050)
Observations	26,718	26,718	26,718	26,718	26,718	26,718
R^2	0.105	0.475	0.096	0.474	0.068	0.470

Notes: VA = Value added, z = Total factor productivity (TFP).

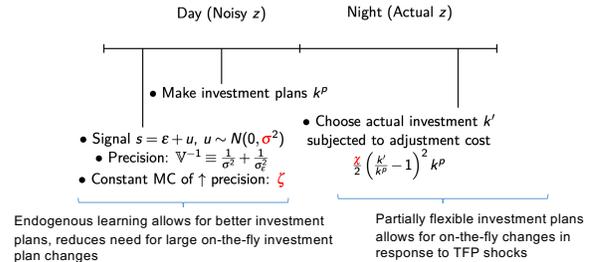
Stylized Fact 2: Investment plans are partially flexible.

- We study how actual investment deviates from planned investment ($\Delta \frac{i}{k}$) in response to shocks to firm profitability.

Performance Measure:	$\Delta \log \text{Sales}$		$\Delta \log VA$		$\Delta \log z$	
	(1)	(2)	(3)	(4)	(5)	(6)
Performance Shock:	2.337*** (0.633)	2.301*** (0.568)	5.023*** (1.267)	3.381*** (1.144)	0.782*** (0.168)	0.532*** (0.155)
i^p		0.648*** (0.050)		0.649*** (0.050)		0.649*** (0.050)
Observations	26,718	26,718	26,718	26,718	26,718	26,718
R^2	0.033	0.471	0.034	0.470	0.034	0.471

Model

We explain our stylized facts using a GE model of **endogenous learning** and **partially flexible investment plans**, embedded into an otherwise standard Hopenhayn (1992) model. Model timing follows that of Arellano et al (2019) and Tanaka et al (2020) to capture information refinement over course of fiscal year.



Key model predictions (verified in data):

- Returns to learning is increasing in productivity
- Larger shocks lead to large investment deviations
- Size of investment deviations decreasing in firm size

Key Results

Question 1: How much misallocation does our model predict, and how does this contrast with a reference model with standard assumptions of fixed homogenous uncertainty and inflexible investment plans.

Answer:

- Misallocation overstated by 7- to 10- times using standard assumptions. Large numbers due to small misallocation in baseline calibration (Column 1)
- Bulk of "excess" misallocation coming from imposing fixed + homogenous uncertainty (Column 4), rather than inflexible investment plans (Column 3).

	Baseline (1)	Fixed \mathbb{V} , $\chi = \infty$ (2)	Fixed \mathbb{V} , $\chi < 0$ (3)	Endogenous \mathbb{V} , $\chi = \infty$ (4)
Panel A: Effect on misallocation				
ΔTFP	0.26%	2.59%	1.75%	0.34%
Δw	0.39%	3.74%	2.53%	0.51%

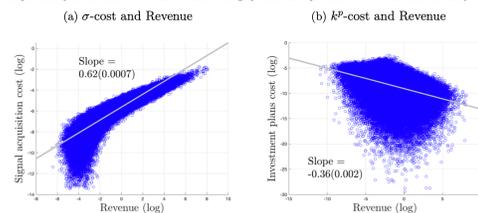
Question 2: Who pays for better information? Who prefers adjusting investment?

Answer:

- High revenue firms rely on making better plans ex-ante
- Low revenue firms rely on investment plan adjustment ex-post

Figure 3: Revenue and Distributions of σ -cost & k^p -cost

The joint probability distribution of cost and revenue. The grey solid line represents a best fit line from ordinary least squares.



Question 3: What does our model imply for business cycle models with "uncertainty shocks"?

Answer:

- Uncertainty shocks arise **endogenously** in our model due to countercyclical returns to learning (a la Prediction 1).

Conclusion

- Making good investment plans are costly, but investment plans are also costly to adjust once in place.
 - Creates trade-off between learning and on-the-fly adjustments.
- Because returns to learning is increasing in productivity,
 - High-productivity firms prefer to make better plans ex-ante.
 - Low-productivity firms prefer on-the-fly adjustments.
- Because managers typically utilize both levers of corporate strategy, overall misallocation due to investment uncertainty is much lower than in typical models.

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