Uncertainty, Imperfect Information, and Expectation Formation over the Firm's Life Cycle

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Research Questions

How do uncertainty and imperfect information drive firm dynamics and aggregate productivity?

We use direct measures of firm sales expectations to

- Provide evidence on learning and imperfect information
- Quantify the impact of imperfect information on aggregate productivity

Data Description

Main data source: Basic Survey of Overseas Business Activities

E.g., Honda of America Mfg., Inc., Honda Alabama LLC, Honda Automobile (China) Co., Ltd.

Additional: Basic Survey of Japanese Business Structure and Activities

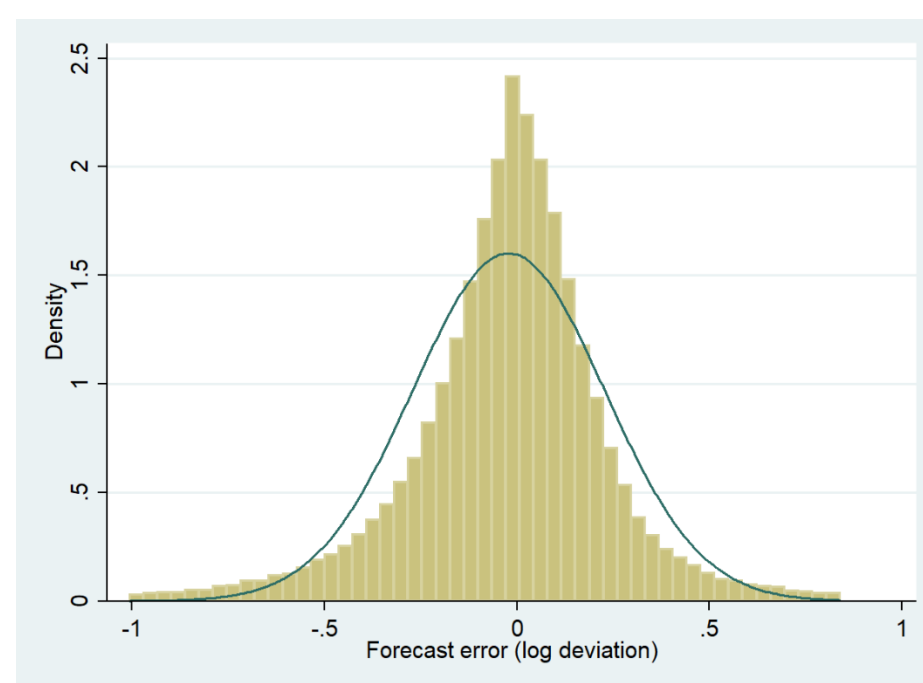E.g., Honda's headquarter in Tokyo

Each firm (firm = subsidiary) reports expected sales next year $E_t(R_{i,t+1})$

Sales forecasts are meaningful:

1. Only 3% of firms predict that $E_t(R_{i,t+1}) = R_{it}$
2. $E_t(R_{i,t+1})$ has stronger predictive power for $R_{i,t+1}$ than R_{it}

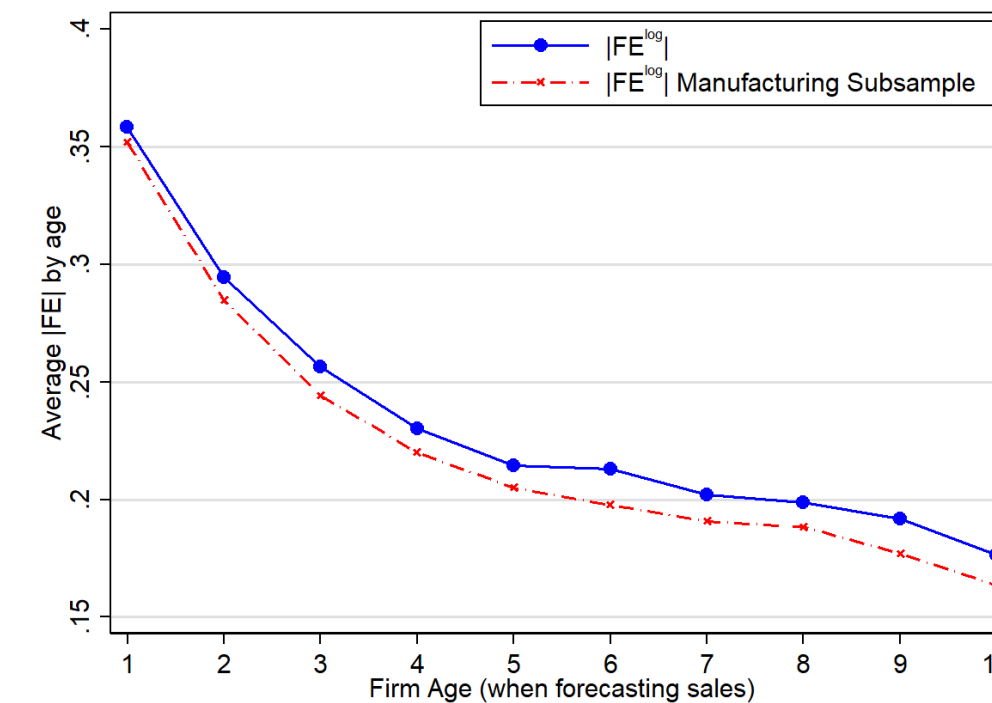We define **forecast errors** (FEs) as

$$FE_{it,t+1} = \log\left(\frac{R_{i,t+1}}{E_t(R_{i,t+1})}\right)$$

- Mean and median of FEs are close to zero
- On average firms under-/over-predict sales by 20%

Empirical Facts

Fact 1: Sales forecasts are more precise when firms are more experienced.

- Patterns validated in regressions with firm age fixed effects.
- Robust to controlling for industry, country-year, and firm fixed effects, firm sizes, market diversification, product diversification
- Robust to restricting the sample to firms that survived up to age 7

Previous exporting experience of the parent company also improves precision: having such experience reduces the firm's initial absolute forecast errors by 13 to 16 p.p.

Fact 2: Forecast errors are less correlated as firms are more experienced.

	All Ages	Age 2-4	Age 5-7	Age ≥ 8
Auto-correlation of FEs	0.136	0.171	0.150	0.119
No. of Obs.	96489	10704	14031	71754

- All correlation coefficients are significant at 1% level.
- Full Information Rational Expectation models imply zero correlation
- Patterns confirmed using AR(1) type of regressions

	Dependent Variable: $FE_{t+1,t+2}$			
$FE_{t,t+1}$	0.102[a]	0.103[a]	0.098[a]	0.098[a]
	(0.014)	(0.017)	(0.014)	(0.017)
$\times \max\{Age_t, 10\}$	-0.006[a]			-0.005[a]
	(0.002)			(0.002)
$\times \log(Age_t)$			-0.020[a]	-0.017[b]
			(0.007)	(0.007)
$\log(Emp_t)$			0.002[c]	0.002[c]
			(0.001)	(0.001)
$\log(Parent\ Emp_t)$			-0.008[c]	-0.008[c]
			(0.004)	(0.004)
N	95274	95274	93539	93539
R^2	0.190	0.190	0.193	0.193

Quantitative Model and Results

Key Model Elements: Helpman et al. (2004) + Noisy info about demand

- Dynamic choices of the mode of serving the foreign market: export, foreign (multinational) production and exit
- Foreign production has lower variable costs but higher entry costs
- Demand is determined by firm-specific, time-invariant parameter θ
- Firms only observe noisy signals $s_t = \theta + \varepsilon_t$

Model matches the two empirical facts:

- Law of large numbers → |FE| declines with firm experience
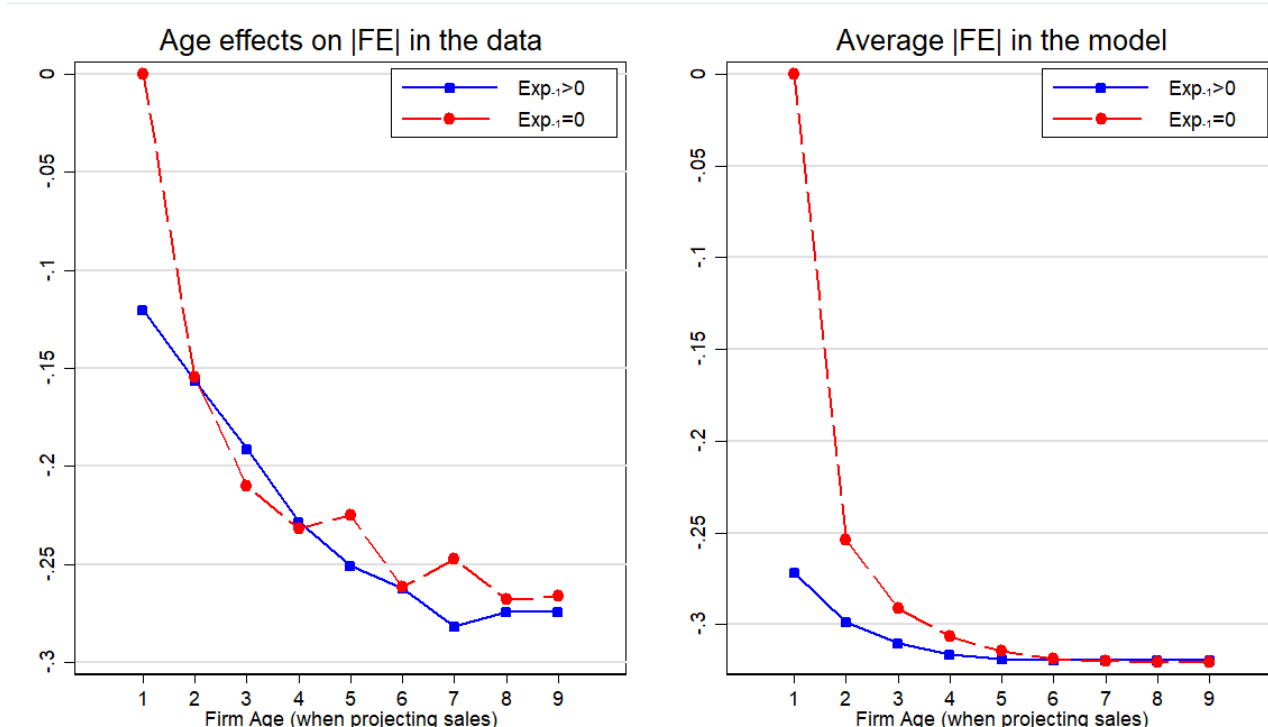- Firms adjust their posterior gradually → Positively correlated FEs

Information friction and aggregate productivity

- Firms with good demand draws θ may not choose to export or may exit under uncertainty → aggregate productivity losses
- We find the signal-to-noise ratios are lower in less developed regions
- Aggregate productivity ↑ by 64% if we move Middle East → USA level
- Aggregate productivity ↑ by 7.3% if we move Africa → USA level

Std. of noise ε_t	Agg. Productivity	Probability of Entrants	Average allocation efficiency index	
		Becoming Unexperienced MNEs	MP v.s. Export	Active v.s. Exiter
10.17 (Middle East)	3.609	0.109	0.721	0.602
2.08 (Africa)	5.513	0.063	0.891	0.762
1.36 (China)	5.785	0.051	0.910	0.757
0.94 (USA)	5.913	0.042	0.927	0.767
0 (Perfect Info.)	6.141	1	1	1

Conclusions and Contributions

- We provide two stylized facts that firms become "better" at predicting sales over their life cycle
- We retrieve data on firms' forecasts and achieve direct mapping from such data to key model parameters
- Information friction and learning affect aggregate productivity through extensive margins and via dynamic selection

We connect to several literatures:

1. A concrete case where a "better technology" (multinational production) may not be adopted due to information friction, echoing the theoretical analysis by Jovanovic and Nyarko (1996). Quantify such a mechanism.
2. Use firm expectations data to answer macroeconomic questions (Bloom et al. 2017, Coibion and Gorodnichenko 2012)
3. Imperfect information and misallocation (David et al., 2016), with an emphasis on the extensive margin. (see extensive margins in other contexts, such as Midrigan and Xu 2014, Buera et al. 2011)

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Acknowledgements and Contact