

K Wasn't Built in a Day: Investment with Endogenous Time to Build

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Discussion by Nicolas Crouzet (Kellogg)

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What is this paper about?

Question: In response to shocks, do firms change how quickly they complete projects?

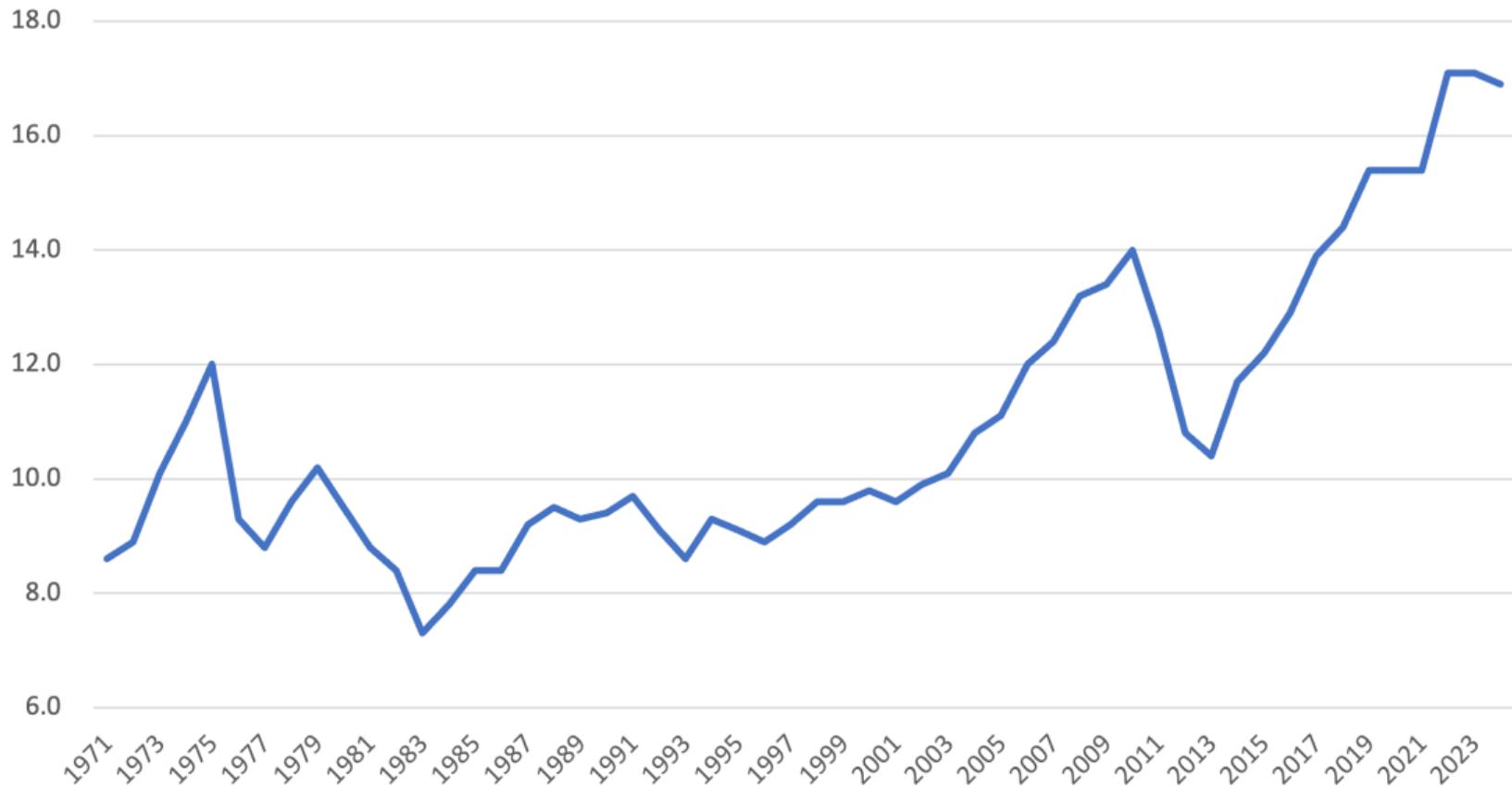
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“Time to build”: gestation lags associated with an investment project

As opposed to intensive margin (spending on ongoing projects), extensive margin (new project starts)

2+units buildings, average month from start to completion



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Implications for monetary and fiscal policy (state-dependence)

Roadmap

1. Theory
2. Empirics

1. Theory

Some bond pricing (yay!)

Investment with time to build T and constant investment rate I per unit of time:

$$\underbrace{V}_{\text{project value}} = - \overbrace{\int_0^T e^{-rt} I dt}^{\text{building costs}} + \underbrace{e^{-rT} xZ}_{\text{terminal payoff}} \quad \text{s.t.} \quad \int_0^T I dt = X$$
$$= -(1 - e^{-rT}) \frac{X}{r} + e^{-rT} zX$$

Like a fixed, negative coupon rate bond!

What is the incentive to speed up project completion, i.e. lower T ?

Marginal benefit from shortening project duration:

$$\begin{aligned} -\frac{\partial V}{\partial T} &= e^{-rT} r zX && \text{bring terminal payoff forward, (+)} \\ &+ \frac{X}{T} e^{-rT} && \text{pay investment costs for less time, (+)} \\ &- \frac{X}{rT^2} (1 - e^{-rT}) && \text{pay higher investment costs per unit time, (-)} \end{aligned}$$

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$$\frac{\partial}{\partial r} \left(-\frac{\partial V}{\partial T} \right) > 0 \quad (\text{as } T \rightarrow 0)$$

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Roughly, the last two effects cancel out (terminal payoff looms large!)

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[Additional insights?]

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2. Testing the model: The paper tests whether $\frac{\partial}{\partial T} \left[\frac{\partial}{\partial r} \left(-\frac{\partial V}{\partial T} \right) \right] < 0$

i.e., do projects that are closer to maturity (lower T) have stronger completion incentives when $r \uparrow$?

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[Role of endogenous investment intensity?]

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[Role of endogenous investment intensity?]

3. **Things that the model leaves out:**

real options

projects closer to completion have less option value

firm gives up less by accelerating

[Test this? Different shock?]

2. Empirics

Measuring time to build

New data source: Completion status of investment projects at the firm \times project \times quarter level

Structures (production facilities, retail facilities, roads, power grids ...)

A lot of censoring

[What compels reporting, and why are 30% of projects “lost to follow-up”?]

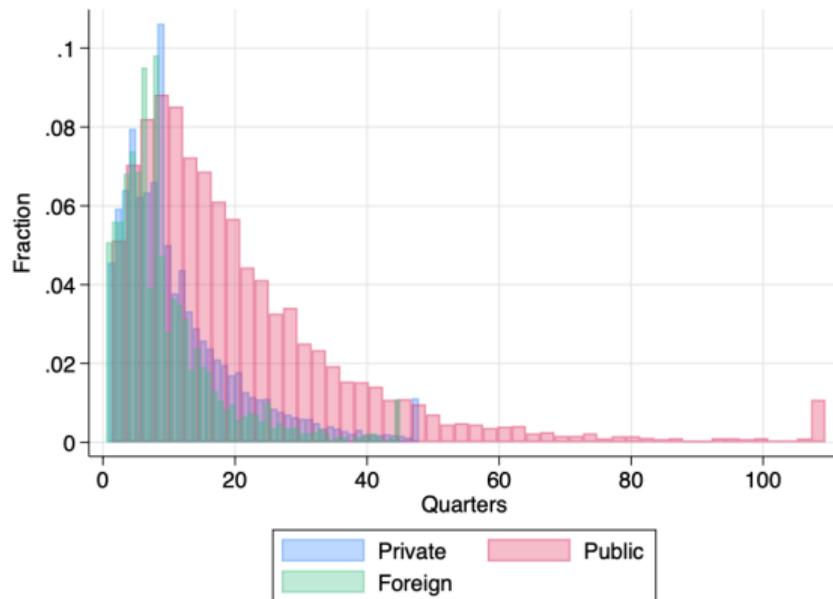
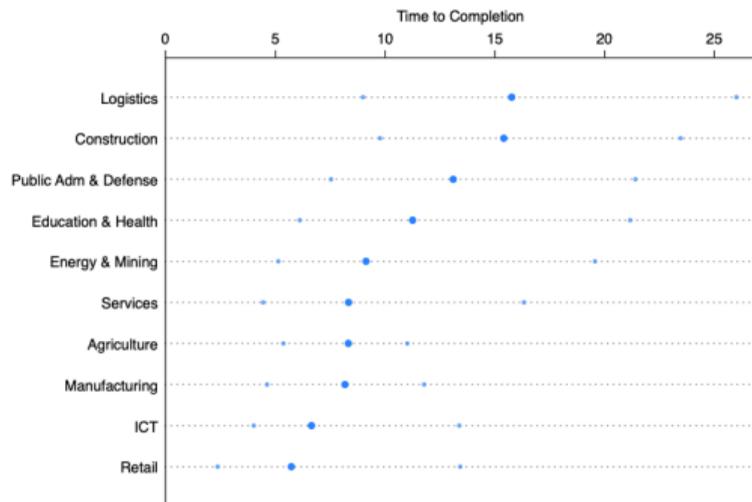
Main stylized facts:

Some variation in TTB accounted for by sector and year started (40%)

Lots of variation remains, particularly within-firm

[Say more on econ magnitudes?]

The distribution of time to build



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Some things we still don't know about

What type of project is it? (e.g. production facility vs. distribution hub vs. mall ...)

Who is tasked with building it? Outsource to third party, or plan and manage internally?

How are capital expenditures allocated across gestation stages?

Do firms control time to build?

Question: do “shocks” to the cost of capital lead to adjustments in time to build?

Benchmark: “natural progression” if fully contracted to third-party and paid for upfront

Do firms reduce or increase TTB relative to that benchmark after the shock?

Shock: 2015 Asset Quality Review

Forced banks with large portfolios of non-performing loans to aggressively provision for them

Main specification:

$$\phi(\text{Completed}_{p,f,t}) = \beta \times \text{Firm exposure to AQR}_{f,t} + \text{Controls and fixed effects} + \nu_{p,f,t}$$

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Broader questions:

How can firms actually speed up project completion? (Internally managed vs. outsourced)

Can banks influence project completion times?

Can firms modify projects in other dimensions? (Scope, quality of execution, ...)

Conclusion

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Great paper: policy-relevant question; new data; simple, powerful mechanism

Main suggestions

- Simpler versions of the theory; role of option value

Research going forward

- How do firms exercise control over completion times; role of outsourcing