

# **Productivity, Investment and Wealth Dynamics under Financial Frictions**

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13 BIS Consultative Council for the Americas Research  
Conference  
Ottawa, October 2023

## The paper

- Relationships between productivity and investment, at the firm-level, under financial restrictions.
  - a thrilling topic, scarcely researched, but full of policy implications
- Motivation sounds macro ("micro evidence on mechanisms underlying macro models"), but it is a fully developed semi-structural micro model.

- Includes:

- A structural dynamic framework at the firm-level under financial constraints.

- An estimation of productivity from a production function with a nonlinear Markovian process.

Estimation draws from very recent techniques to deal with latent variables in nonlinear contexts. ABB (2017) and more.

- Estimation of nonlinear policy functions of investment and evolution of debt, exploiting rich varying derivatives wrt productivity.

- A thought provoking paper to be read by anyone interested in these topics, very competently done and well written.

## Summary

- Model, including financial constraints specified as  $k_{jt+1} \leq \gamma(a_{jt}, \omega_{jt})$ , leaves us with:

$$y_{jt} = \beta_L l_{jt} + \beta_K k_{jt} + \omega_{jt} + \varepsilon_{jt}$$

$$i_{jt} = h_t(k_{jt}, a_{jt}, \omega_{jt}, v_{jt})$$

$$a_{jt+1} = g_{t+1}(a_{jt}, k_{jt}, \omega_{jt}, u_{jt}),$$

where productivity  $\omega_{jt}$  is assumed a Markov process.

- Model creates a good thing (new instrument  $a_{jt-1}$ ), but also a drawback for the "proxy" techniques:  $\omega_{jt} = f(k_{jt}, a_{jt}, i_{jt}, v_{jt})$  includes  $a_{jt}$  and  $v_{jt}$ .

- Paper estimates OP/LP with no  $a_{jt}$ , a linear Markov-linear policy version with  $a_{jt}$ , and a nonlinear Markov-nonlinear policy version with  $a_{jt}$ .
- Significant changes in the  $\beta's$  and productivity distribution if one uses OP/LP, but almost no change once that  $a_{jt}$  is included.
- Rich nonlinear variation of the derivatives wrt productivity, consistent as evidence of collateral and earnings-based financial constraints. Convergence of MPK for same productivity firms is however low.

## Comments

- Questions raised on my mind (and could be nice to deal or recognize).

### On the model:

- What happens with firms non financially-constrained? Should  $a_{jt}$  still be in the policy functions of these firms?
- Why  $r$  and  $W$  are not included in the policy functions?
- May be the model misses a mechanism? Investment is assumed to reinforce productivity ("endogenous productivity"). This would imply a controlled Markov process. Researchers have included R&D (DJ, 2013), innovation, exports...

- OP show that exit from the market may introduce surviving-conditional correlation in the process of productivity biasing capital coefficient.
- It seems quite ad-hoc to consider that  $a_{jt}$  should enter in the demand for perfectly variable labor conditional on capital. No justification and this suppresses a perfectly valid proxy.

## On the estimation:

- Not clear how LP is estimated (a note says cannot be applied without materials). Can be done with  $l$ , even with a fully nonlinear Markov process.
- Non inclusion of varying  $W$  can determine biases in the  $\beta'$ s (can be positive for  $\beta_L$ ).
- The nonlinearities of productivity are very similar to the consumer income shocks of ABB. Is this what we expect?
  - Persistence is likely to be linked to investments in R&D that produce process innovations.
  - How is the persistence of productivity obtained through product innovations?
- Do we have evidence of Hicksian productivity change? What happens with the share of labor?



## **On the results:**

- We cannot perform counterfactuals because the policy functions are reduced form. Could we however try to answer questions as the following:
- Is there a varying sensitivity of investment to debt? Is this sensitivity independent from productivity? Could tell us about borrowing problems.
- Can firms accumulate debt despite the previous value of debt? Could tell us about debt limits.

In summary:

- An extraordinary paper that opens many topics and ways to research.