Felipe Meza, Sangeeta Pratap, Carlos Urrutia (2020). Credit and investment distortions: Evidence from Mexican manufacturing, EL 197, 109610

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Introduction

Motivation

The paper analyzes the influence of financial factors (credit flows and interest rates) on firms' investment decisions and capital accumulation through their effect on dynamic capital distortions.

The authors build a multi-industry model to measure labor and investment wedges using data for the Mexican manufacturing sector and assess their importance in accounting for aggregate capital and TFP over time.

Main takeaways

The two results arise:

- Changes in dynamic capital distortions are important in accounting for the path of capital over time
- Industry specific investment wedges and credit conditions are correlated — industries where the availability of credit falls and/or real interest rates increase experience an increase in their capital distortions

Main contributions

- Contribute to the strand of literature on the positive effects of the finance sector to the real economy
- Setup a production and investment model to measure the wedges for the Mexican manufacturing sector
- Build upon the merged dataset of Meza *et al.* (2019), linking output, employment and investment with credit flows and interest rates for Mexican industries between 2003 – 2013

The environment

The environment

There are n industries, each one a representative firm, facing two distortions: static labor wedge and dynamic investment wedge.

Technology is described as follows:

$$Y_t^i = A_t^i (K_t^i)^{\alpha^i} (L_t^i)^{1-\alpha^i},$$

where A^i is an industry specific shock.

The environment

Firms own their capital stock and maximize the expected present value of profits net of investment expenditures

$$\Pi^i = E_0 \sum_{t=0}^{\infty} \left(\frac{1}{1+\iota} \right)^t \left\{ p_t^i Y_t^i - \theta_t^{L,i} w_t L_t^i - \theta_t^{K,i} \times \left[K_{t+1}^i - (1-\delta) K_t^i \right] \right\}$$

where $\theta_t^{L,i}$ and $\theta_t^{K,i}$ are stochastic industry-specific distortions that affect labor and investment, respectively.

Total output is combined $Y_t = \prod_{i=1}^{n} \left(Y_t^i \right)^{\omega^i}$, with ω^i constant expenditure share in each industry.

Model

- **Static labor allocation**

$$L_t^i = \left(\frac{\omega^i (1-\alpha^i)}{\Phi_t \theta_t^{L,i}} \right) L_t \tag{1}$$

- **Dynamic Euler equation**

$$\Psi^i \overline{\theta_t^{K,i}} = \rho_A^i \overline{p_t^i A_t^i} - E_t (1-\alpha^i) \overline{K_{t+1}^i} - (1-\alpha^i) \rho_L^i \overline{\theta_t^{L,i}} \tag{2}$$

- **Aggregation**

$$Y_t = \sum p_t^i A_t^i (K_t^i)^{\alpha^i} \left(\frac{\omega^i (1-\alpha^i)}{\Phi \theta_t^{L,i}} \right)^{1-\alpha^i} \tag{3}$$

The Meza *et al.* (2019) data set

Two sources:

- **Survey:** Encuesta Industrial Anual (EIA), INEGI. $\sim$ 7,000 manufacturing establishments with information on all 86 4-digit NAICS 2007 industries (82 when excluding Oil and missing values)
- **Administrative data:** Universe of commercial credit loans by banks reports (R04C), CNBV, aggregated annually to 4-digit NAICS 2007 (using a probabilistic crosswalk to match CNBV-NAICS classification)

Measuring labor wedges ($\theta_t^{L,i}$)

- Use US data for α^i (Hsieh and Klenow, 2009)
- Compute revenue productivity:

$$p_t^i A_t^i = \frac{p_t^i Y_t^i}{(K_t^i)^{\alpha^i}(L_t^i)^{1-\alpha^i}}$$

- Estimate persistence parameter, ρ_A^i, for each 2-digit industry using Arellano-Bond estimator — recover Fixed Effect for each 4-digit industry to estimate steady-state values
- The labor wedge is computed from (1)
- The persistence parameter ρ_L^i and its steady-state are estimated analogously
- Value added shares, ω^i, are computed directly from the EIA

Measuring investment wedges ($\theta_t^{K,i}$)

Given ρ_A^i and ρ_L^i, set initial guess for ρ_K^i, and the initial steady-state values $\theta^{\bar{K},i}$ and $\bar{K}^i$, and compute the investment wedge with (2).

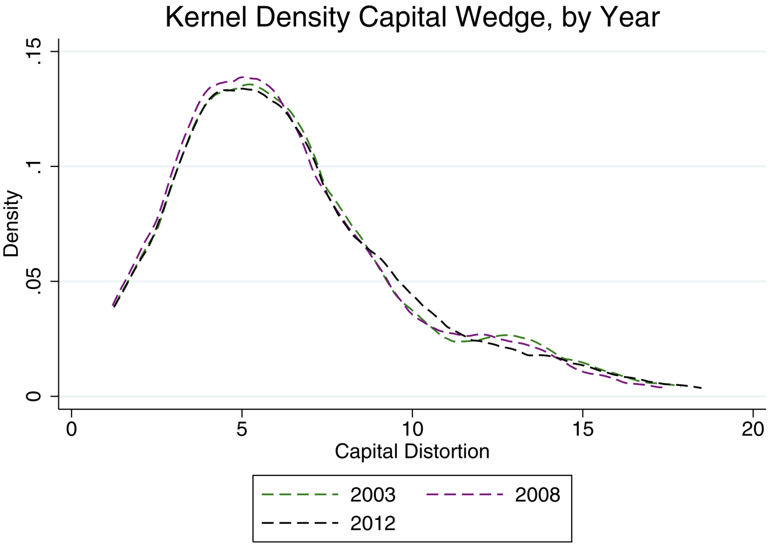
We use these to update the estimates of ρ_K^i and $\theta^{\bar{K},i}$ using the Arellano-Bond estimator and repeat until parameters converge.

Results

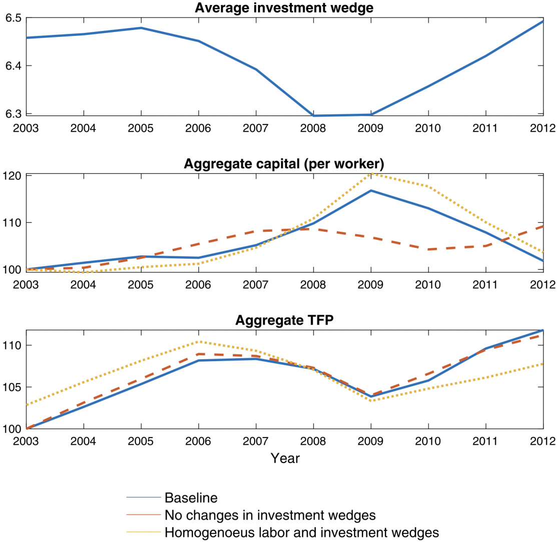
Descriptive Statistics for the Capital and Labor Distortions

	2003-05	2005-08	2008-09	2009-12
Investment Wedge ($\theta_t^{K,i}$)				
- Mean	6.46	6.38	6.30	6.39
- C.V. (std. deviation/mean)	0.60	0.59	0.60	0.60
- Correlation with Employment (L_t^i)	-0.03	-0.03	-0.01	-0.03
- Correlation with Productivity ($p_t^i A_t^i$)	0.19	0.12	0.14	0.16
Labor Wedge ($\theta_t^{L,i}$)				
- Mean	1.00	1.00	1.00	1.00
- C.V. (std. deviation/mean)	1.17	1.19	1.18	1.19
- Correlation with Employment (L_t^i)	0.00	-0.00	-0.01	-0.02
- Correlation with Productivity ($p_t^i A_t^i$)	0.59	0.56	0.57	0.50
Correlation between distortions	0.55	0.58	0.57	0.57

Estimated Kernel densities for investment wedges



Aggregate capital, TFP and average investment wedges



Investment wedges and credit conditions

Correlations			
	Total credit	Credit/value added	Interest rate
$\theta_t^{K,i}$	−0.089	−0.159	0.068
$\theta^{\overline{K,i}}$	−0.097	−0.190	0.121

Regressions: Dependent variable $\theta_t^{K,i}$				
	(1)	(2)	(3)	(4)
Credit/value added	−0.738*	−0.712*		
	0.159	0.158		
Interest rate			0.187*	0.168*
			0.078	0.078
Time dummies	Yes	Yes	Yes	Yes
2-digit industry effects	No	Yes	No	Yes

Note: Standard errors below coefficients.

*Denotes significance at the 5% level.

Conclusion

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Credit plays a crucial role to explain the evolution of TFP, more over it can be analyzed by understanding the dynamic capital distortions.