

From Firm Productivity Dynamics to Aggregate Efficiency

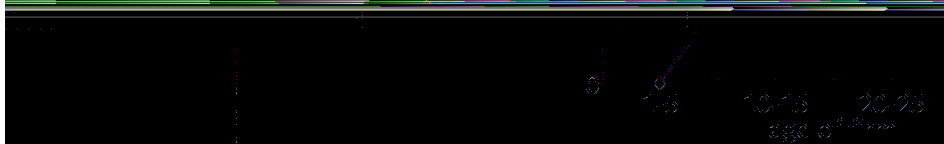
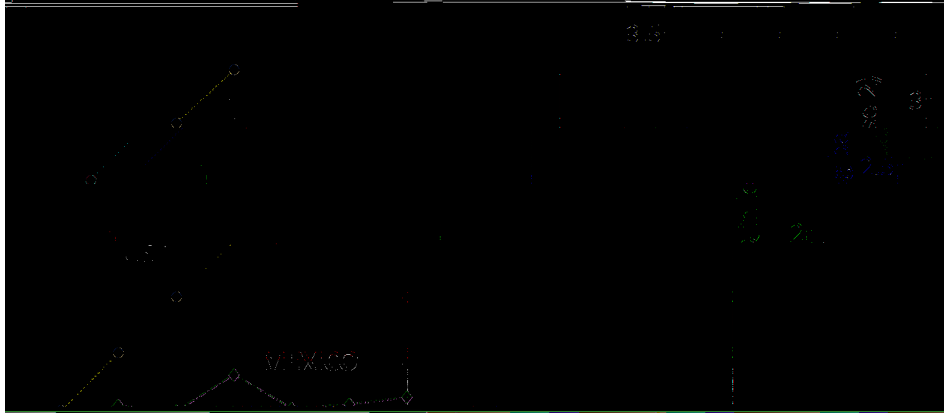
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Productivity Growth of Firms over their Life Cycle



Introduction

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Part of these TFP differences have been attributed to:

Larger dispersion of marginal product of capital and labor across firms in developing economies, ***misallocation***.

- | Evidence found in many countries: Hsieh & Lenow (2009), Busso, Madrigal & Pages (2011).
- | For example: reducing dispersion across manufacturing plants in Mexico to level of US implies a TFP gain of approx. 50%.

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What models (and frictions) can explain these observations?

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Financial constraints: firms without sufficient collateral are not able to produce with optimal level of capital, then mg. product of capital is not equalized across firms.

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then financial constraints reduce the growth of productivity at the firm level, reducing aggregate TFP.

Introduction

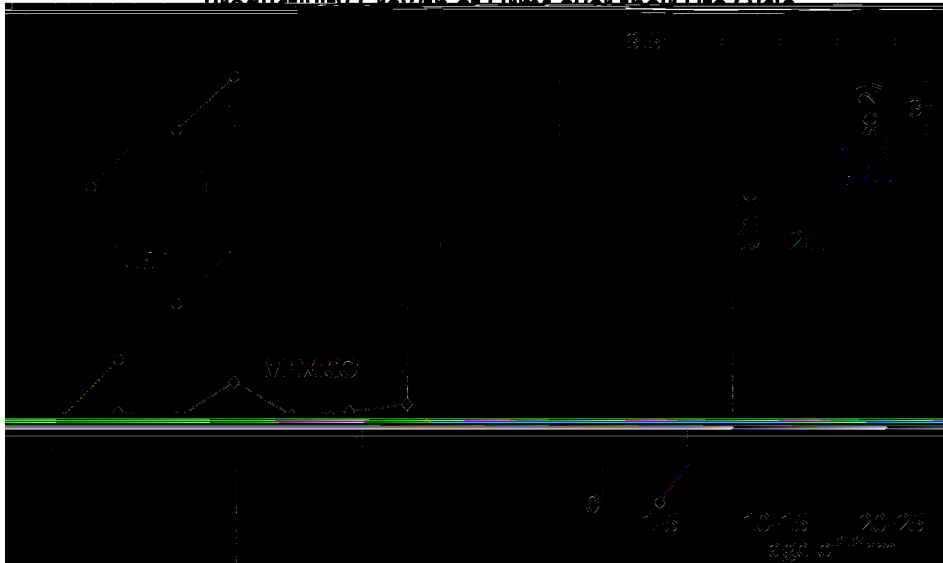
To analyze this mechanism we can extend previous models w/endogenous firm productivity accumulation:

firms make investments to improve productivity every period (Pakes & McGuire, 1994; Klette & Kortum, 2004), firm productivity evolves stochastically,

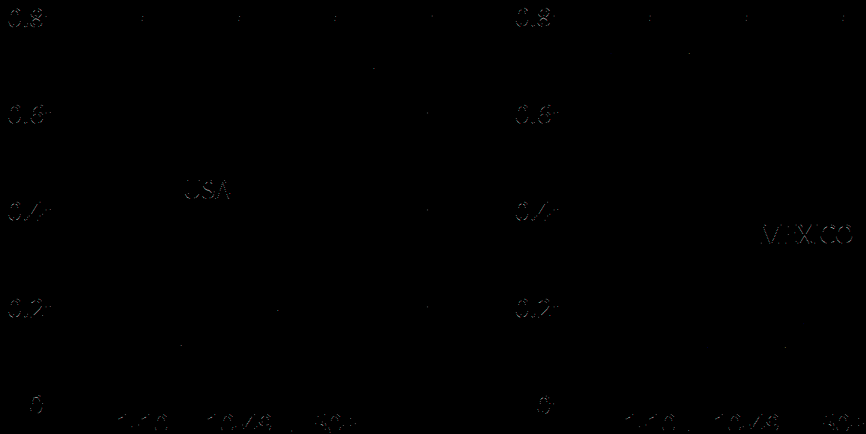
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Distribution of $\hat{\beta}_1$ and $\hat{\beta}_2$



In the model the following mechanisms come into play:

financial constraints lower the incentives of entrepreneurs to invest in productivity (entrepreneur will not be able to produce at optimal level and reap benefits of higher productivity), lower wages lead to lower ability individuals entering the economy (a standard result since Lucas, 1978).

Quantitativ Mod I: Outlin

Main elements of the model:

- occupational choice: entrepreneur or worker,
- financial constraints,
- investment in knowledge capital (stochastic),
- small open economy,
- (extended model with productivity shocks, informal sector in paper).

Builds upon Lucas (1978), Hopenhayn (1992), Pakes & McGuire (1994), Klette & Kortum (2004), Buera, Kaboski & Shin (2011).

Production Technology

Entrepreneur w/ability j (fixed) has access to the technology:

$$q = (j n)^{1-n} f(k, l)^n$$

where:

q is production of final good,

$f(k, l) = k^a l^{1-a}$, $n \geq (0, 1)$ decreasing returns-to-scale,

j is permanent ability of the entrepreneur, distribution $h(j)$,

knowledge a *ital* n , accumulated through investment in innovation good x .

Innovation Technology

Every period knowledge capital n can **increase**:

$$P(n^0 = n(1 + D)j n, x) = (1 - g) \frac{(1 - l) a(x/n)}{1 + a(x/n)} + g$$

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Probability of a **decrease** (*bad* *ho* *k*) in knowledge capital:

$$P(n^0 = n/(1 + D) | n, x) = \frac{(1 - g) l}{1 + a(x/n)}$$

With remaining probability, remains **unchanged**.

Worker

$s = f, n_w, b$, problem of worker is a savings b decision:

$$v_w(s) = \max_{f, b} u(c) + \beta \int Q(z') v_w(s')$$

$$s.t. \quad c + b = w + (1+r)b$$

Entrepreneur

$s = (j, n, b)$, entrepreneurs choose $b \geq 0$ and $x \geq 0$ to max:

$$v_e(s) = u(c) + b(1 - m) \int P(n^j, n, x) \max_{f, w} f v_w(s^b), v_e(s^b) g$$

subject to budget constraint:

$$c + b = p(s) + x + (1 + r)b$$

Entrepreneur

$s = f, n, b, g$, entrepreneurs choose $b \geq 0$ and $x \geq 0$ to max:

$$v_e(s) = u(c) + b(1 - m) \int_{f, n, g} P(f, n, g, x) \max_{f, n, g} f v_w \quad \mathbf{d}$$

Financial Enforcement Constraint

In the case of no-default the entrepreneur receives **ND**:

$$\max_{flg} q \quad w l \quad (r + d) k \quad x + (1 + r) b$$

while in the case of default the entrepreneur would receive **D**:

$$\max_{flg} (1 - y) (q \quad w l + (1 - d) k) \quad x$$

capital level is **enforceable** if it satisfies **ND** **D**, implying a bound $\bar{k}(s)$ on capital rental (a reduced form of capturing differences in property rights/creditor protection).

Predetermined Parameters.

parameter	value	description
$b(1 - m)$	0.92	effective discount factor
s	1.50	risk aversion
r	0.04	interest rate (small open economy)
n	0.85	span-of-control
a	1/3	income share of capital
d	0.08	capital depreciation rate
a	3.00	innovation technology
l	0.70	innovation technology

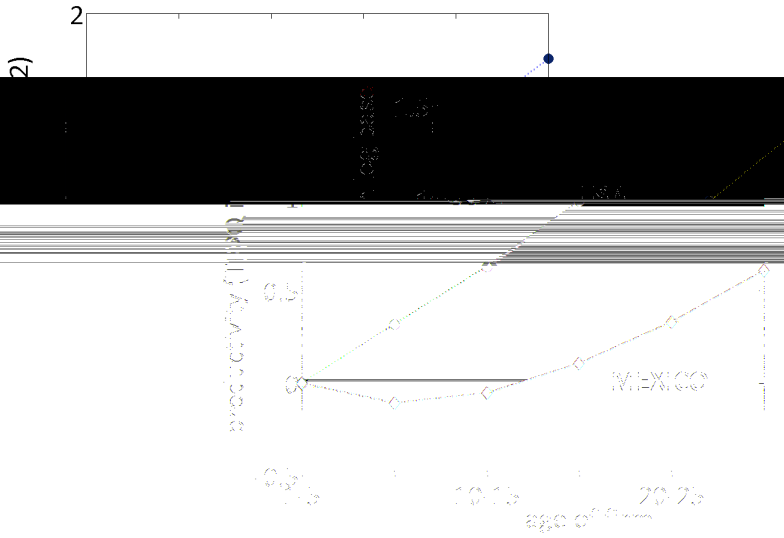
Cali rated Parameters - US Moments.

parameter	symbol	value
exogenous exit rate	m	0.05
firm entry probability	J	0.04
Pareto dist.	q	4.34
innovation technology	g	0.24
initial knowledge capital	n_w/\underline{n}	1.91
size innovation steps	D	0.38
target statistics	data	model
death rate large firms	0.05	0.05
total firm entry/exit rate	0.10	0.11
std. deviation growth rates	0.25	0.25
relative size firms [20-25]/[1-5] years	2.48	2.46
employment at firms w/50+ workers	0.69	0.60
knowledge capital investment/total output	4.40	3.83

Quantitative Exercise

We lower y to target the ratio of private credit/output in an emerging economy of 20%.

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Main Results.

statistics	US	EE
weighted firm productivity	1.00	0.80
TFP	1.00	0.92
aggregate output	1.00	0.66
firm productivity [20-25]/[1-5] years	2.61	1.26

Final Comment

We have explored a new channel through which financial constraints have an impact on aggregate TFP: they distort the incentives to invest in productivity at the firm level.

Extended model with informal sector (low productivity and low growth firms w/no access to credit) and forthcoming: quantitative relevance of size dependent distortions vs. financial constraints.

Buera, Kaboski and Shin (2015): more research is needed in endogenous entrepreneurial productivity!