

The Aggregate Costs of Uninsurable Business Risk

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Motivation

- Private businesses account for a large share of macroeconomic activity
- Two key characteristics
 1. predominantly rely on internal saving and collateralized borrowing
 2. ownership poorly diversified
- Most work studies aggregate costs of credit constraints
- We argue lack of diversification much more costly

Our Paper

- Use Orbis data to document that
 - private businesses experience large fluctuations in profits
 - due to large, fat-tailed and transitory changes in output
 - that are not accompanied by changes in capital and wage bill
- Interpret with relatively standard model of entrepreneurship
 - credit constraint and undiversified firm ownership
 - persistent and transitory productivity shocks from fat-tailed distribution
 - capital and labor chosen before observing productivity

Findings

- Large aggregate costs of financial frictions
 - calibration to Spain predicts output is 15.8% lower than absent frictions
- Losses primarily accounted for by risk, not credit constraints
 - eliminating risk distortions would increase output by 15.4%
 - eliminating credit distortions would increase output by only 0.4%
- Why?
 - firm owners can reduce risk exposure by inefficiently reducing scale
 - so firm size primarily limited by exposure to risk, not availability of credit

Key Ingredients

- Three key ingredients responsible for result
 1. productivity shocks are fat-tailed – rare disasters
 2. and have large transitory component
 3. labor chosen before observing productivity
- Absent any of these, much smaller fluctuations in firm profits
 - so credit, not risk, main driver of aggregate losses
 - e.g. if labor flexible, 4/5th of output losses due to credit frictions

Data

- Orbis Global Database
 - firm-level data from national registers and other sources
 - annual balance sheet and income statements, 1995–2019
- Focus on Spain, similar results for other countries
- Sample selection: partnerships and private limited companies
 - all sectors except FIRE, Public Administration, Defense
 - keep firms with data for at least 4 years
 - 623,000 firms with 10 years of data on average

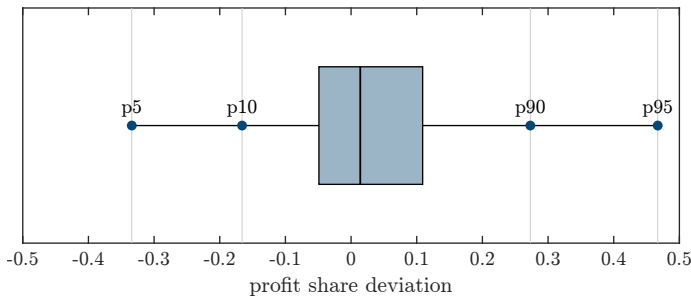
Variables

- output y_{it} value added = production – all non-labor costs – taxes
- labor wl_{it} wages and benefits
- capital k_{it} book value of property, plant, equipment, intangibles
- profits π_{it} output – labor – depreciation – $0.02 \times$ capital
- As in Hsieh-Klenow, labor = wage bill (euros), not employment (bodies)
 - implicitly interpret differences in wages as differences in skill

summary stats

Profit Shares Fluctuate Considerably

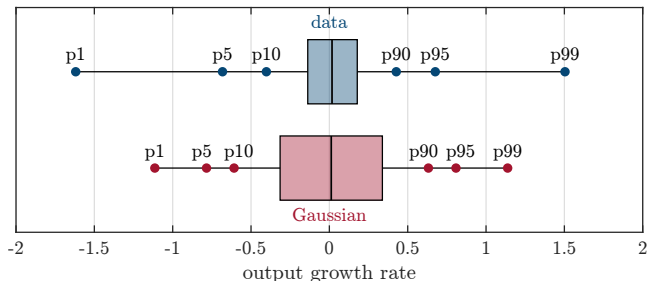
- Deviation of profit share from firm's time-series mean: $\pi_{it}/y_{it} - \overline{\pi_{it}/y_{it}}$
 - for reference, mean $\pi_{it}/y_{it} = 0.13$; statistics output-weighted



- Occasionally large declines in profit share
 - e.g., 5% of firms experience losses of 20% of output ($-0.33 + 0.13$)

Output Changes Fat-tailed

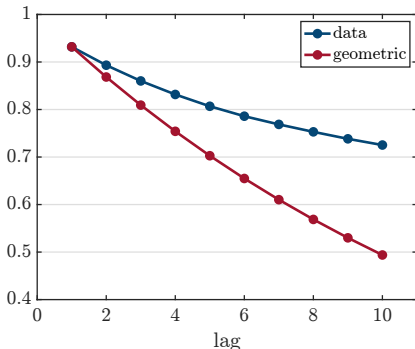
- Distribution of output growth $\log y_{it} - \log y_{it-1}$
 - compare to Gaussian with same mean (0.01) and standard deviation (0.48)



- Changes in output typically small (low iqr), occasionally large (high std)

Output Changes Transitory

- Autocorrelogram of output $\rho(k) = \text{corr}(\log y_{it}, \log y_{it-k})$
 - compare to process with geometric decay $\rho(1)^k$



- Suggests mix of transitory and persistent components

Capital and Labor Do Not Track Output Closely

- If production function homogeneous and input choices flexible
 - input payments add up to constant fraction of output so comove perfectly
 - test by regressing $\Delta \log w_{it}$ and $\Delta \log k_{it}$ on $\Delta \log y_{it}$

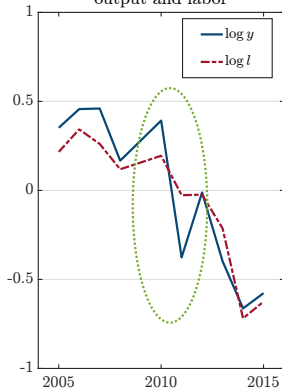
	$\Delta \log w_{it}$	$\Delta \log k_{it}$
A. all observations		
$\Delta \log y_{it}$	0.399 (0.001)	0.160 (0.001)
B. $ \Delta \log y_{it} < 0.5$		
$\Delta \log y_{it}$	0.583 (0.001)	0.313 (0.001)

- Suggests labor and capital not flexibly chosen

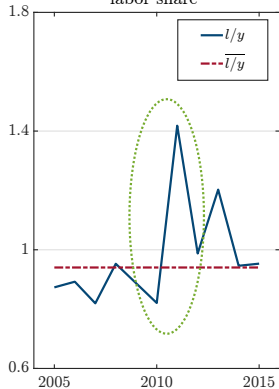
low frequency

Example of a Firm

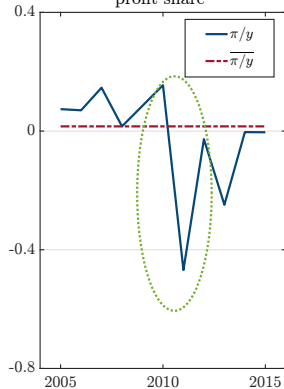
output and labor



labor share



profit share



Private Businesses Are Poorly Diversified

- Data from Spanish Survey of Household Finances, 2008–2020
- Entrepreneur (12 % of households)
 - owns a business
 - actively involved in running the business
 - has positive business wealth

fraction of entrepreneurs who own exactly one business	0.93
share of business wealth from main business (multi-business owners)	0.71
share of main business that the entrepreneur owns	0.83
fraction of entrepreneurs who own 100% of main business	0.71

- Consistent with U.S. evidence in Moskowitz-Vissing-Jorgensen (2002)

Model Overview

- Small open economy, so constant interest rate r
- Unit mass of households heterogeneous in entrepreneurial ability z
 - work and receive labor income W or
 - run a private business, receive labor income ϕW and profits
- Occupation, labor and capital choice made before observing ability
- Two frictions
 - cannot issue equity: own 100% of business; no explicit insurance
 - collateral constraint limits ability to borrow

Problem of Households

- Preferences

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{c_{it}^{1-\theta}}{1-\theta}$$

- Those who enter as workers have cash-on-hand

$$m_{it} = W + (1+r)a_{it}$$

- Those who enter as entrepreneurs with debt b_{it} , capital k_{it} and labor l_{it}

$$m_{it} = \phi W + \underbrace{y_{it} - Wl_{it} - Rk_{it}}_{\pi_{it}} + (1+r) \underbrace{a_{it}}_{k_{it}-b_{it}}$$

$$y = z\varepsilon (k^\alpha l^{1-\alpha})^\eta$$

persistent z and transitory ε productivity not known when choose k, l

- Can switch occupation freely each period

Losses from Financial Frictions

	total	due to risk	due to credit
misallocation, $-\log Z/Z^P$	0.108	0.110	0.002
output losses, $-\log Y/Y^P$	0.158	0.154	0.004
wage losses, $-\log W/W^P$	0.278	0.264	0.004

- Modest role for credit constraints, much larger role for risk

On the Role of Credit Constraints

- Quantify importance of collateral constraint by varying how much entrepreneurs can borrow

	no borrowing	no credit limit
$\Delta \log Z$, rel. to baseline	-0.009	0.000
$\Delta \log Y$, rel. to baseline	-0.025	0.003
$\Delta \log W$, rel. to baseline	-0.013	0.001

- Intuition: uninsurable risk
 - reduces desired labor and capital and increases precautionary wealth
 - so collateral constraint less likely to bind

Why Is Risk So Important?

- All key ingredients we introduced critical
 - fat-tailed shocks
 - transitory shocks
 - labor chosen in advance
- Risk much less important if shut any of these down
 - illustrated by re-calibrating each model and redoing decomposition

Summary

- Uninsurable business income risk has significant macro consequences
 - much larger than those from limited access to credit
- Used Orbis data to document
 - large fluctuations in profit shares
 - due to large, fat-tailed, transitory output changes
 - not accompanied by changes in inputs
- Model of entrepreneurship consistent with evidence
 - firms can reduce risk exposure by operating at smaller scale
 - leads to large losses from misallocation, inefficiently low output and wages
 - mostly accounted for by risk

Summary Statistics

- Sample: 5.7M firm-year obs., '000 2015 USD

	mean	p10	p25	p50	p75	p90
output	486	32	67	151	350	792
wage bill	351	24	52	118	268	594
capital	594	6	21	83	294	844
profit	63	-24	-1	9	38	117
employment	12	1	2	5	10	21

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Low Frequency

- Regress $\log wl_{it}$ and $\log k_{it}$ on $\log y_{it}$

	$\log wl_{it}$	$\log k_{it}$
$\log y_{it}$	0.92	0.84

- Regress $\log \overline{wl_{it}}$ and $\log \overline{k_{it}}$ on $\log \overline{y_{it}}$

	$\log \overline{wl_{it}}$	$\log \overline{k_{it}}$
$\log \overline{y_{it}}$	0.97	0.93

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Autocorrelation of Output

- Consider sum of AR(1) and transitory component

$$\log y_{it} = z_{it} + \sigma_u u_{it}$$

$$z_{it} = \rho z_{it-1} + \sigma_z e_{it}$$

- Unconditional variance of z

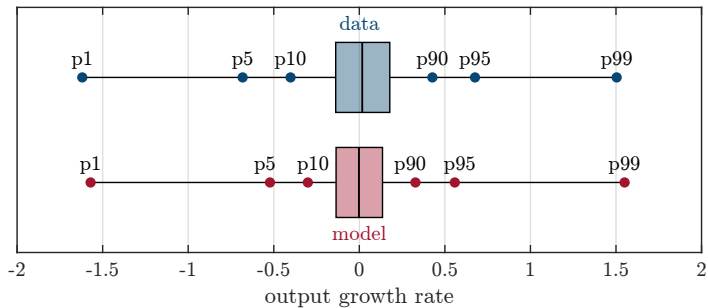
$$v_z = \rho^2 v_z + \sigma_z^2 = \frac{\sigma_z^2}{1 - \rho^2}$$

- So autocorrelation

$$\text{corr}(\log y_t, \log y_{t-k}) = \frac{v_z}{v_z + \sigma_u^2} \times \rho^k$$

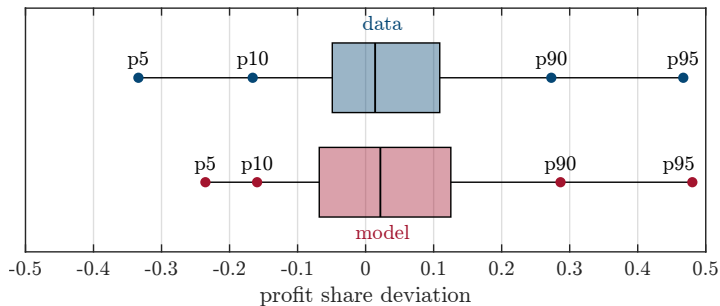
- Misleading to interpret low autocorrelation as sign of low ρ

Distribution of Output Growth



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Distribution of Profit Share Deviations



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Comovement of Inputs and Output

- Slope coefficient from regressions on $\Delta \log y$
 - observations with $|\Delta \log y| < 0.5$

	$\Delta \log wl$	$\Delta \log k$	$\Delta \pi/y$	$\Delta \hat{\pi}/y$
Data	0.58	0.31	0.46	0.10
Model	0.55	0.61	0.42	0.06

Additional Moments

	data	model
s.d. $\Delta \log w l_{it}$	0.36	0.32
iqr $\Delta \log w l_{it}$	0.22	0.23
autocorr $\log w l_{it}$	0.96	0.97
s.d. $\Delta \log k_{it}$	0.60	0.36
iqr $\Delta \log k_{it}$	0.28	0.27
autocorr $\log k_{it}$	0.96	0.97
slope Δc_{it} on $\Delta \pi_{it}$	0.02	0.02

- Δc_{it} and $\Delta \pi_{it}$ are over three years, data is EFF (799 observations)

Parameterization of Alternative Models

	data	no fat tails	no transitory shocks	flexible labor
fraction entrepr	0.12	0.12	0.11	0.12
wealth to income entrepr	12.5	12.5	12.4	12.5
capital-output ratio, k/y	1.22	1.22	1.25	1.22
labor share, wl/y	0.72	0.73	0.74	0.72
profit share, π/y	0.13	0.13	0.11	0.14
iqr $wl_{it}/y_{it} - \overline{wl_{it}/y_{it}}$	0.15	0.15	<i>0.04</i>	0.00
s.d. $\log y_{it}$	1.32	1.32	1.32	1.32
s.d. $\log y_{it}/y_{it-1}$	0.48	0.42	0.46	0.50
s.d. $\log y_{it}/y_{it-2}$	0.60	0.60	<i>0.70</i>	0.59
s.d. $\log y_{it}/y_{it-3}$	0.69	0.74	<i>0.90</i>	0.68
iqr $\log y_{it}/y_{it-1}$	0.32	<i>0.47</i>	0.34	0.32
iqr $\log y_{it}/y_{it-2}$	0.46	<i>0.71</i>	<i>0.61</i>	0.45
iqr $\log y_{it}/y_{it-3}$	0.58	<i>0.89</i>	<i>0.86</i>	0.58
corr $\log y_{it}, \log y_{it-1}$	0.93	0.95	0.94	0.93
corr $\log y_{it}, \log y_{it-2}$	0.89	0.90	<i>0.86</i>	0.90
corr $\log y_{it}, \log y_{it-3}$	0.86	0.85	<i>0.78</i>	0.87

Parameterization of Alternative Models

		no fat tails	no transitory shocks	flexible labor
β	discount factor	0.956	0.971	0.955
α	capital elasticity	0.185	0.213	0.205
η	span of control	0.926	0.950	0.904
ρ	persistence z	0.979	0.940	0.980
σ_u	volatility z	0.053	0.028	0.017
σ_ε	volatility ε	0.148	—	0.028
s	relative volatility mixture	—	6.919	10.37
p	baseline probability mixture	—	0.911	0.910
ϕ	relative time endowment	0.962	0.968	0.944

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Robustness

	baseline	lower risk aversion	corporate firms
misallocation, $-\log Z/Z^P$			
total	0.108	0.064	0.105
due to risk	0.110	0.064	0.101
due to credit	0.002	0.000	0.001
output losses, $-\log Y/Y^P$			
total	0.158	0.092	0.135
due to risk	0.154	0.090	0.129
due to credit	0.004	0.001	0.003
wage losses, $-\log W/W^P$			
total	0.278	0.167	0.172
due to risk	0.264	0.164	0.168
due to credit	0.004	0.001	0.003

Targeted Moments: Robustness

	data	lower risk aversion	corporate firms
fraction entrepr	0.12	0.13	0.13
wealth to income entrepr	12.5	12.5	12.5
capital-output ratio, k/y	1.22	1.22	1.22
labor share, wl/y	0.72	0.72	0.73
profit share, π/y	0.13	0.13	0.12
iqr $wl_{it}/y_{it} - \overline{wl_{it}/y_{it}}$	0.15	0.16	0.15
s.d. $\log y_{it}$	1.32	1.33	1.32
s.d. $\log y_{it}/y_{it-1}$	0.48	0.48	0.48
s.d. $\log y_{it}/y_{it-2}$	0.60	0.60	0.60
s.d. $\log y_{it}/y_{it-3}$	0.69	0.70	0.70
iqr $\log y_{it}/y_{it-1}$	0.32	0.30	0.28
iqr $\log y_{it}/y_{it-2}$	0.46	0.46	0.46
iqr $\log y_{it}/y_{it-3}$	0.58	0.60	0.61
corr $\log y_{it}, \log y_{it-1}$	0.93	0.93	0.93
corr $\log y_{it}, \log y_{it-2}$	0.89	0.90	0.90
corr $\log y_{it}, \log y_{it-3}$	0.86	0.87	0.86
value of objective	—	0.005	0.007

Parameter Values: Robustness

		lower risk aversion	corporate firms
β	discount factor	0.971	0.971
α	capital elasticity	0.171	0.169
η	span of control	0.934	0.963
ρ	persistence z	0.979	0.980
σ_u	volatility z	0.012	0.008
σ_ε	volatility ε	0.086	0.086
s	relative volatility mixture	13.54	12.03
p	baseline probability mixture	0.933	0.913
ϕ	relative time endowment	0.970	0.993

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