

Invariances and Diversities in the evolution of business firms

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Paris, December 2010

Sketching the research framework

Pervasive heterogeneity

- in size
- in production structure
- in growth
- in profitabilities

Self-reinforcing mechanisms

- in growth processes
- in diversification processes
- in location processes (No time)

Conclusions

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Major research question

Fundamental drivers of the evolution of contemporary economies are the activities of

- search
- discovery
- economic exploitation

of new products, new production processes, new organizational arrangements within and amongst business firms

Given that, what are the statistical properties that such processes might possibly display?

3 operative questions

- **First**, are there distinct characteristics of the micro-entities (in primis, business firms) and their distributions which systematically persist over time?
- **Second**, how do such possible heterogeneous characteristics within the population of competing firms affect their relative evolutionary success over time?
- **Third**, amongst the foregoing statistical properties and relations between them, which ones are invariant across industries, and, conversely, which ones depend on the technological and market characteristics of particular sectors?

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Empirically based Industrial Dynamics

Main building block:

- we are well aware of a continuing movement of the elements which make up the population as it appears
- still certain economic distributions are stable over time

This points to the idea of **steady-state equilibrium**: “a state of macroscopic equilibrium maintained by a large number of transitions in opposite directions” (Feller, 1957).

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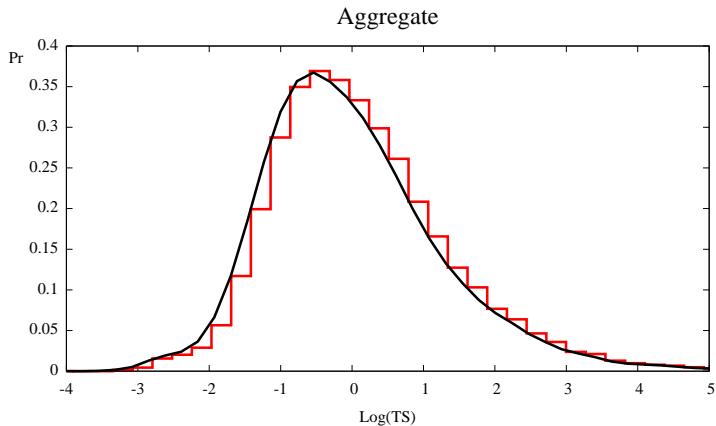
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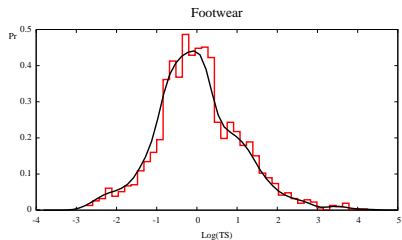
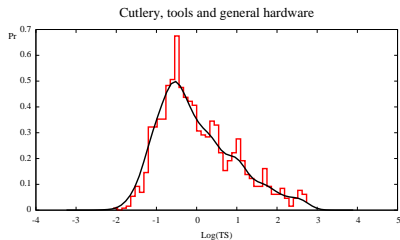
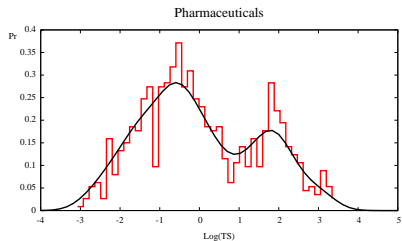
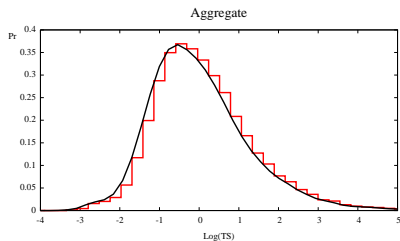
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FSD - Firm size distribution



Italian manufacturing industry, 1997

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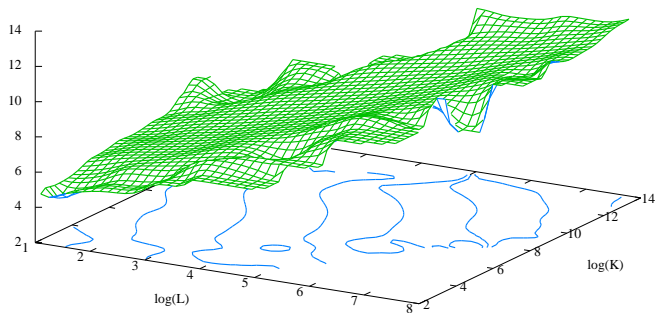
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VA production function



Kernel estimates of the conditional expectation of output(VA): **High Risk** firms in Manufacturing - 2002.

Single input productivity distributions

- Widespread heterogeneity again persistent over time
- We do not find evidence of a simple relation predicting that financial conditions should map on to one with efficiency in production. Two tentative interpretations.
- Results are robust to sectoral disaggregation at 2-digit level.

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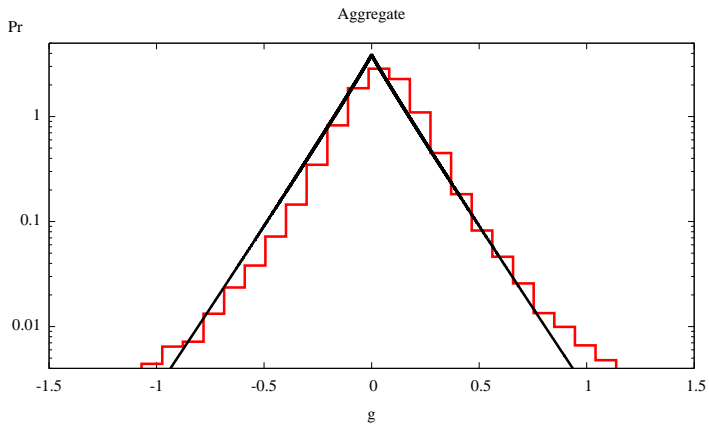
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FGRD - Firm growth rates distribution

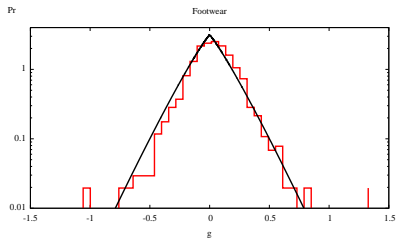
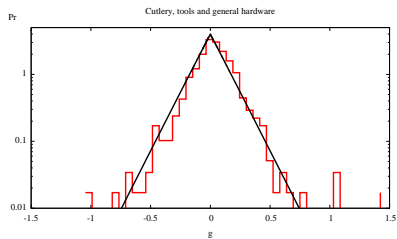
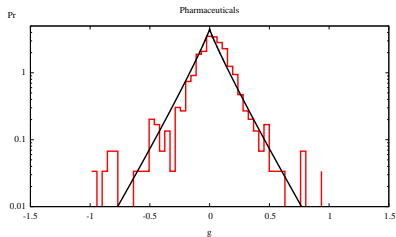
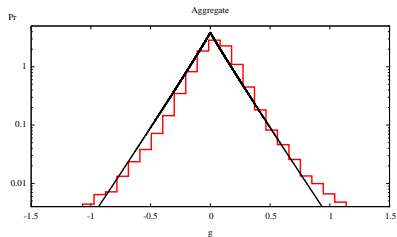
Let us consider again the normalized (log) firm size $s_i(t)$. We then define growth rates as its first difference:

$$g_i(t) = s_i(t + 1) - s_i(t)$$



Italian Manufacturing industry, 1997

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Firms profitability distribution

Consider the variable

$$GM_i(t) = (VA_i(t) - W_i(t)) / VA_i(t)$$

where GM_i is gross operating margins; VA_i is value added; W_i is the total wage cost.

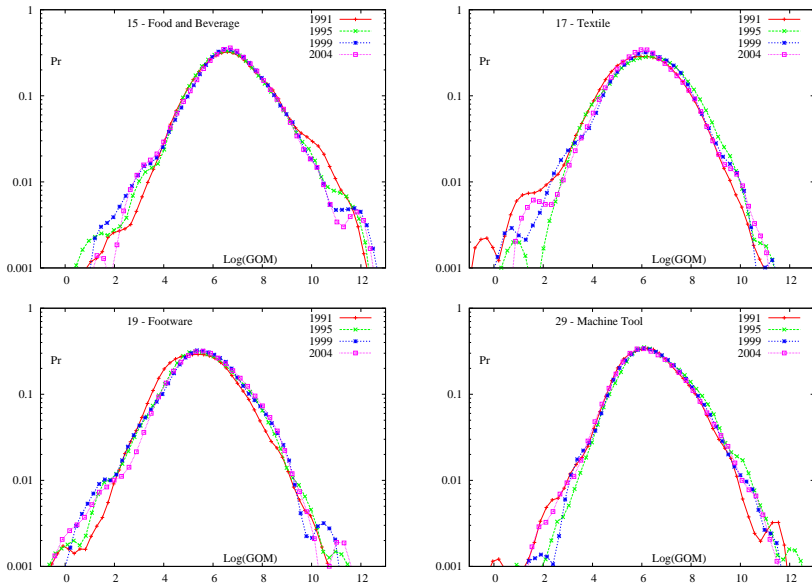


Figure: Empirical densities of (log) Gross Margin by sector. Thousands of euro, deflated with production price index. Italian data..

Most robust findings on profitability

A sum up of the most robust findings on profitability

- wide distributions of probabilities across firms characterize all sectors
- stability over time
- some (mild) regression to the mean tendencies

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Positive-feedback model

Observed growth as the cumulative effect of diverse “events”

$$g(t; T) = s(t + T) - s(t) = \epsilon_1(t) + \epsilon_2(t) + \dots = \sum_{j=1}^{G(t; T)} \epsilon_j(t)$$

- shock ϵ_j are independent from size s
- opportunities G progressively captured by firms

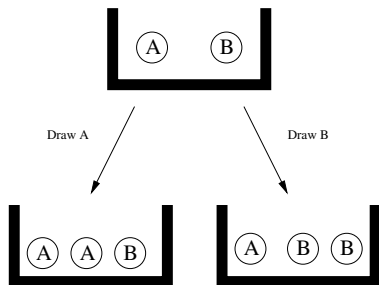
Suppose to have M opportunities to be assigned to N firms. One possibility is to assign each opportunity with the same probability **BUT this implies a Gaussian growth rate distribution.**

The Polya Assignment of Business Events

1. Consider an urn with N different balls, each representing a firm

Draw a ball and replace

2. with **TWO** of the same kind. (Here the first draw from an urn with two types of ball)

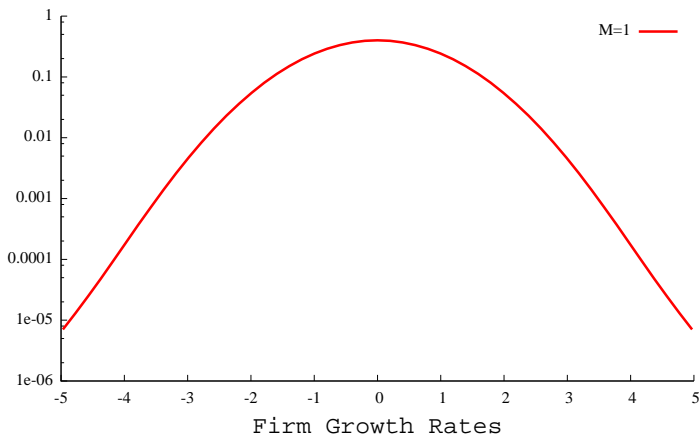


3. Repeat this procedure M times

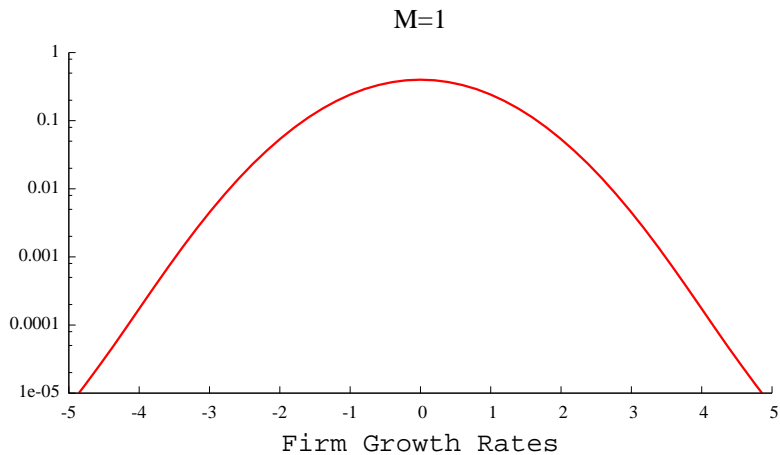
RESULT: partition of M events on N firms.

Convergence result

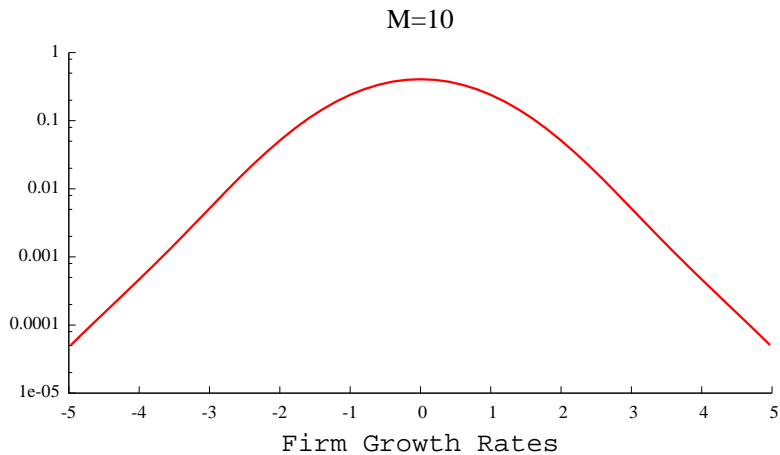
When the number of opportunities is very low the FGRD generated by the model is almost gaussian. When M increases



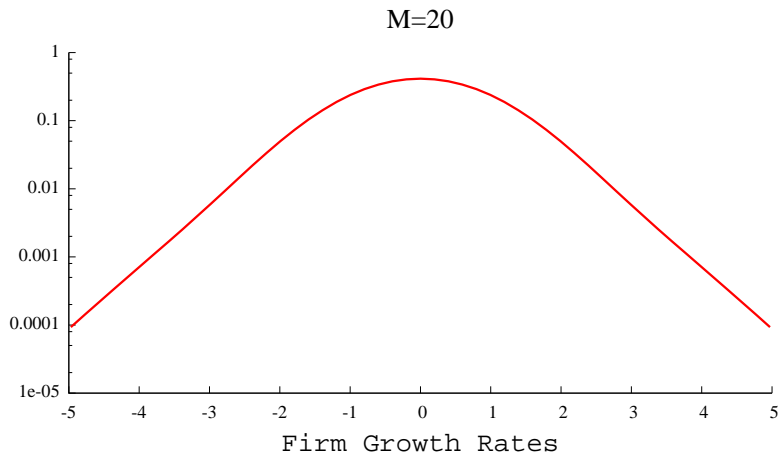
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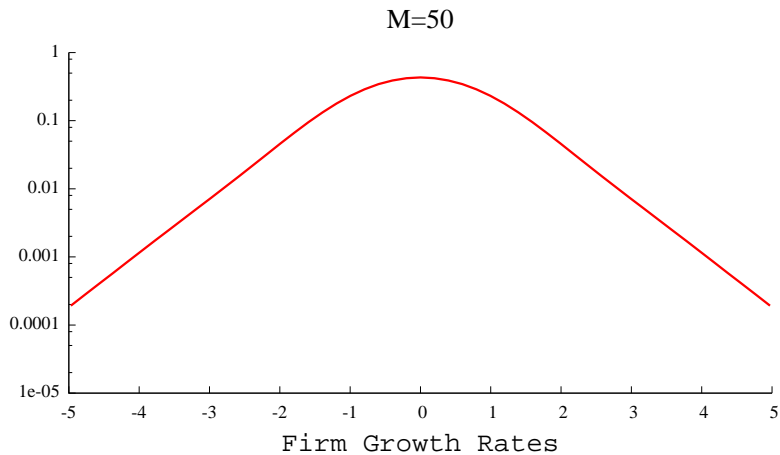
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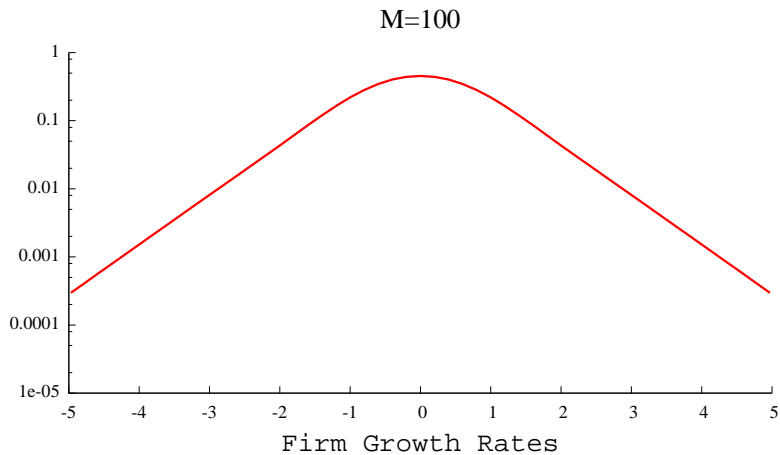
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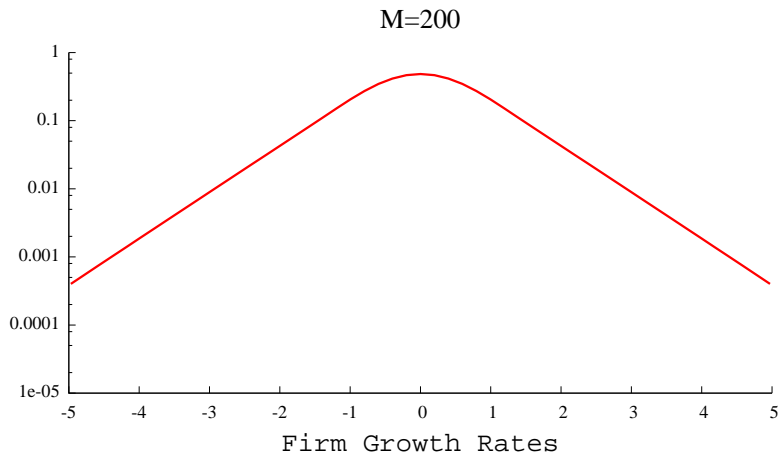
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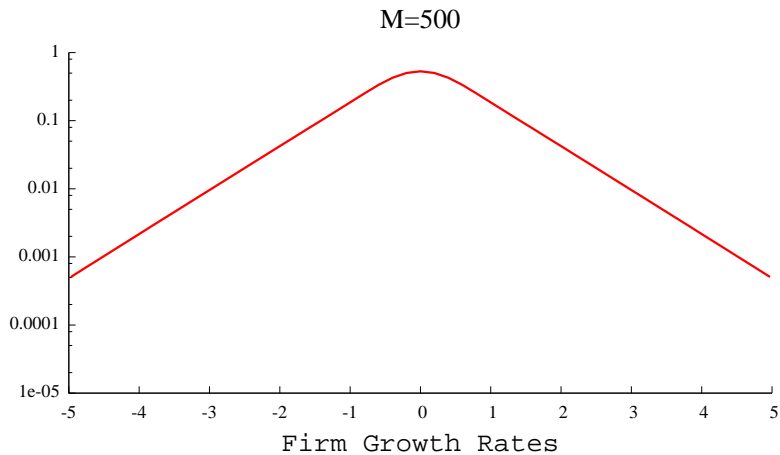
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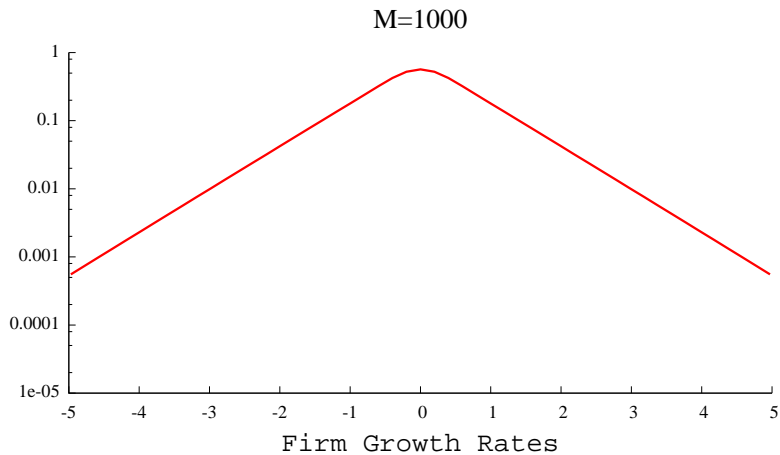
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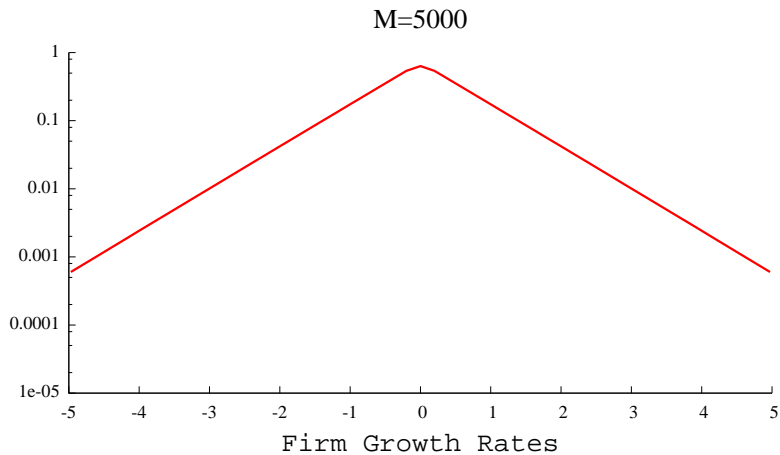
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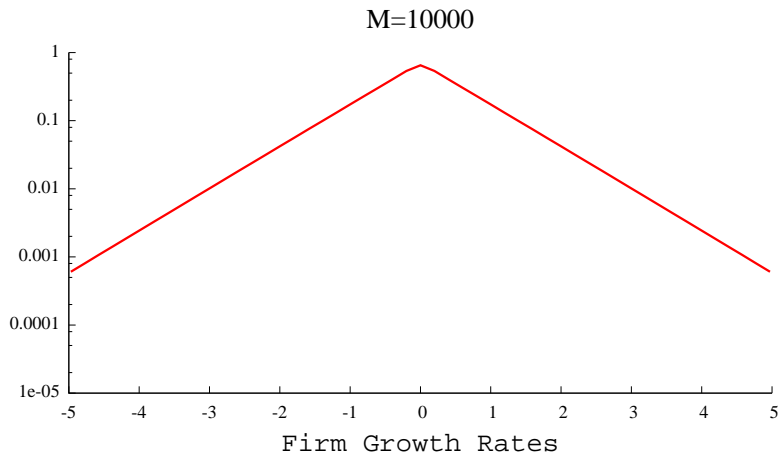
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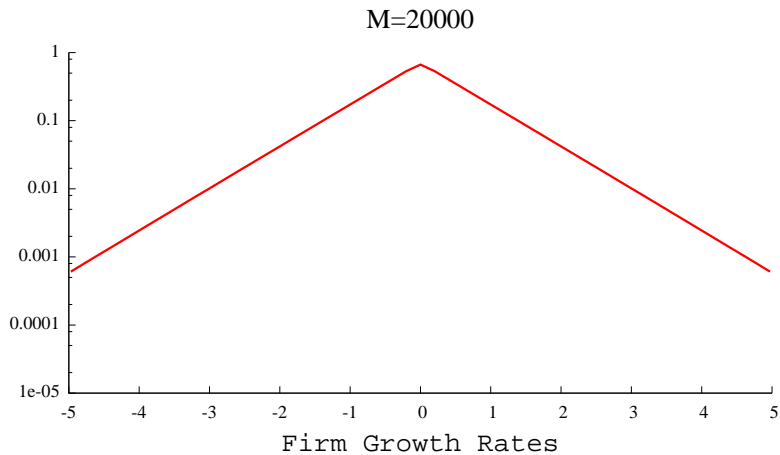
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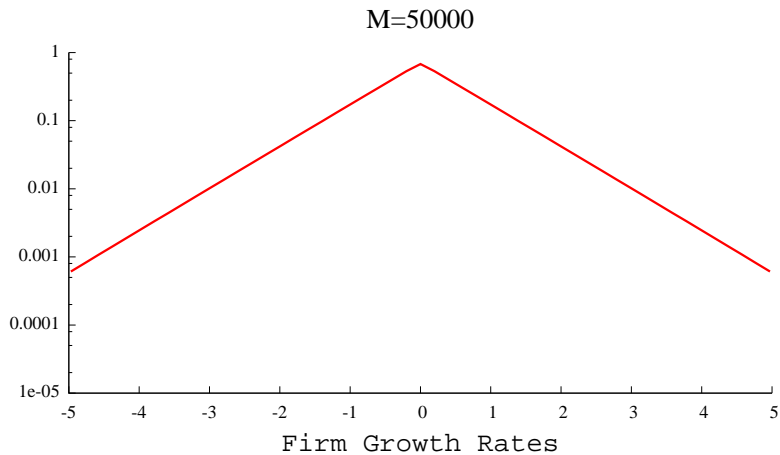
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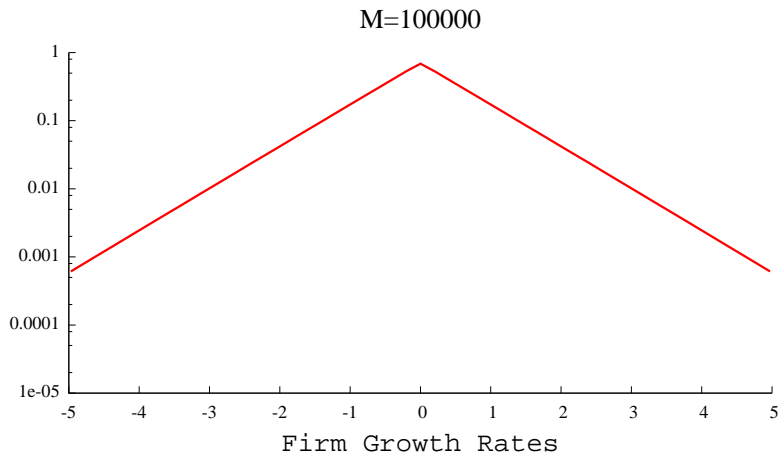
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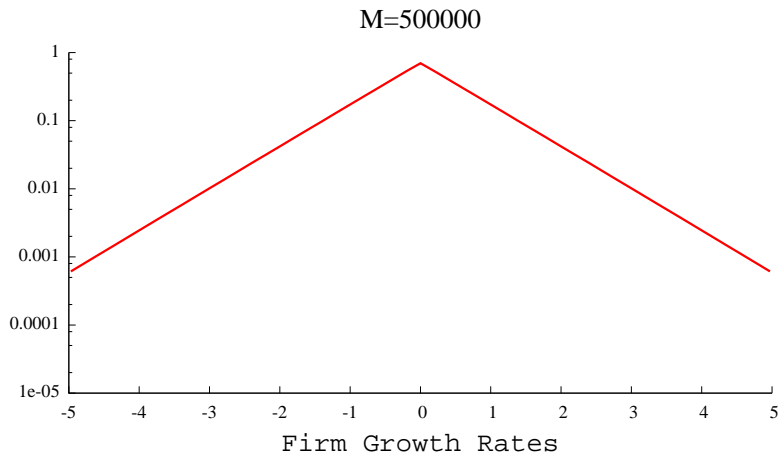
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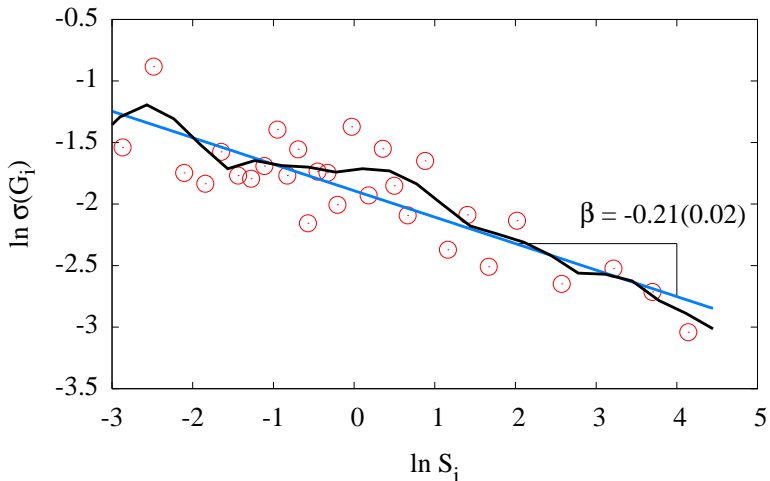
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Dividing firms in size classes and computing the Log(Std.Dev) for their growth rates



$$G_i(t) = \sum \frac{\tilde{S}_{ij}(t+1)}{\tilde{S}_i(t)} - 1 = \sum_j \frac{1}{N_i(t)} G_{ij}(t) \Delta_{ij}(t) \quad (1)$$

where

- $G_{ij}(t) = \frac{\tilde{S}_{ij}(t+1)}{\tilde{S}_{ij}(t)} - 1$ Growth in a given sub-market
- $\Delta_{ij}(t) = \frac{N_i(t) \tilde{S}_{ij}(t)}{\tilde{S}_i(t)}$ Corporate Coherence
- $N_i(t)$ Diversification

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No observed relation with S!
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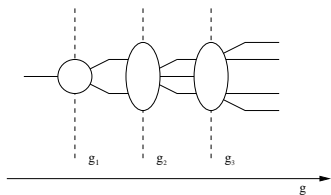
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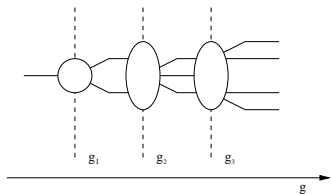
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It must have a relation with S



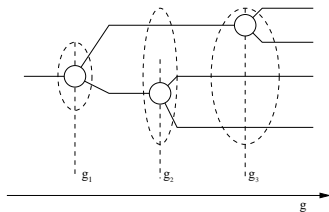
Random diversification: random arrival of independent diversification events during the firms' history

Linear relation between N and S



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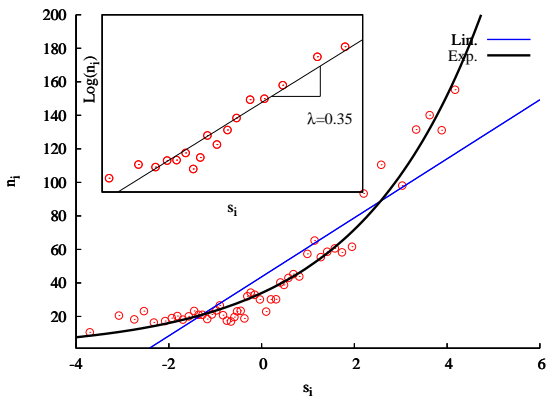
Linear relation between N and S



Scope economy to diversification: the capability of a firm to enter a new market increases with its past successful diversification events

Exponential relation between N and S

Clear exponential relation between $N_i \sim S_i$



The sole diversification explains the relation $\text{var}_{it}[G_i(t)] \sim S_i!$

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The model is the policy

1. Empirical investigations detect regularities emerging from heterogeneous behavior;
2. these regularities suggest the presence of self-reinforcing mechanisms possibly operating at different levels (growth, diversification, . . .)
3. capturing these effects is a **necessary condition** to obtain more reliable models of industrial dynamics,
4. in turn offering (perhaps) interesting insights also for more aggregate models.