Invariances and Diversities in the evolution of business firms

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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

Outline

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?

Outline

Empirically based Industrial Dynamics

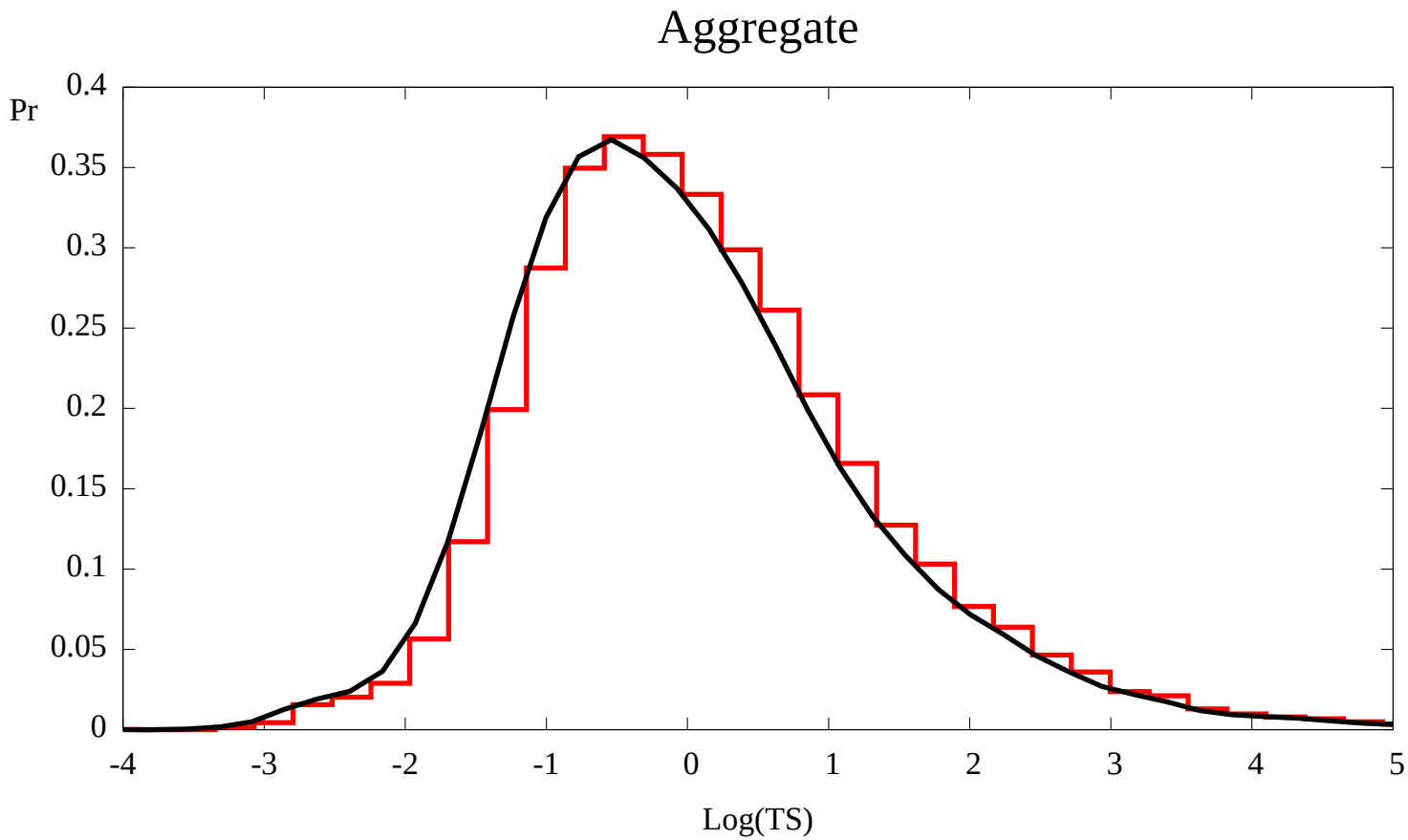
Main bulding block:

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

Outline

FSD - Firm size distribution



Italian manufacturing industry, 1997

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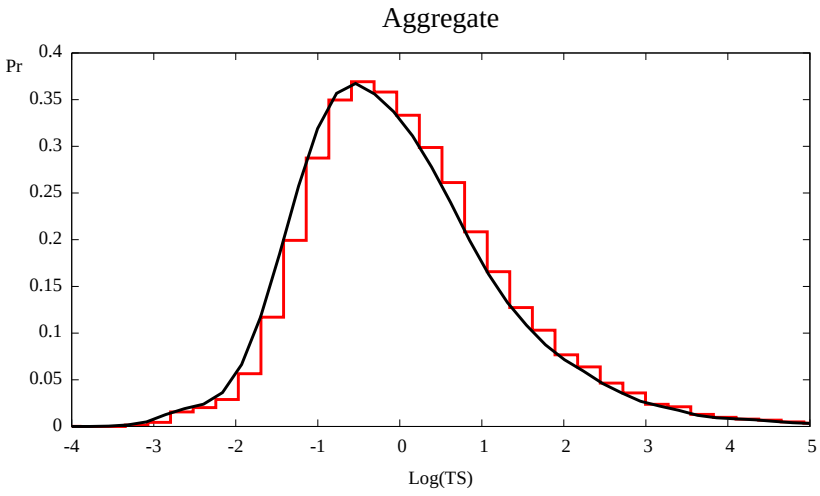
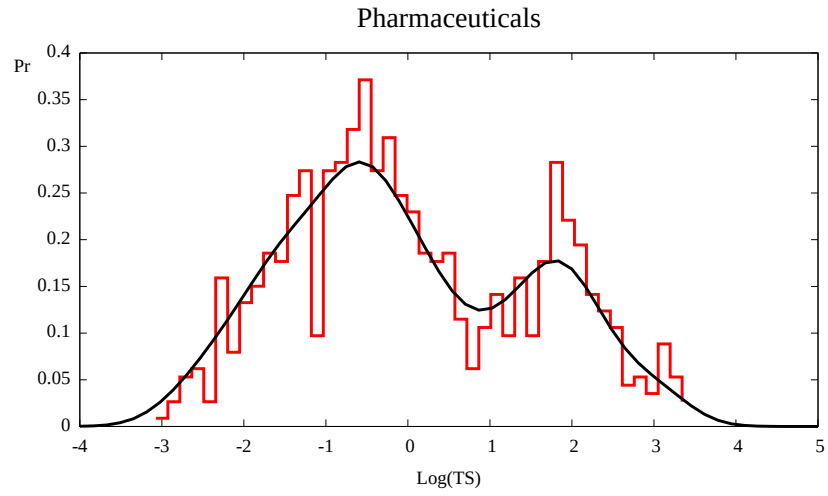
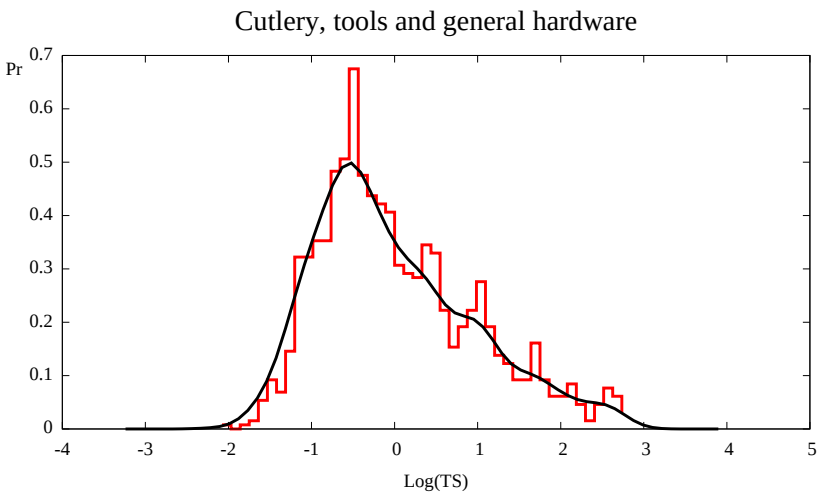
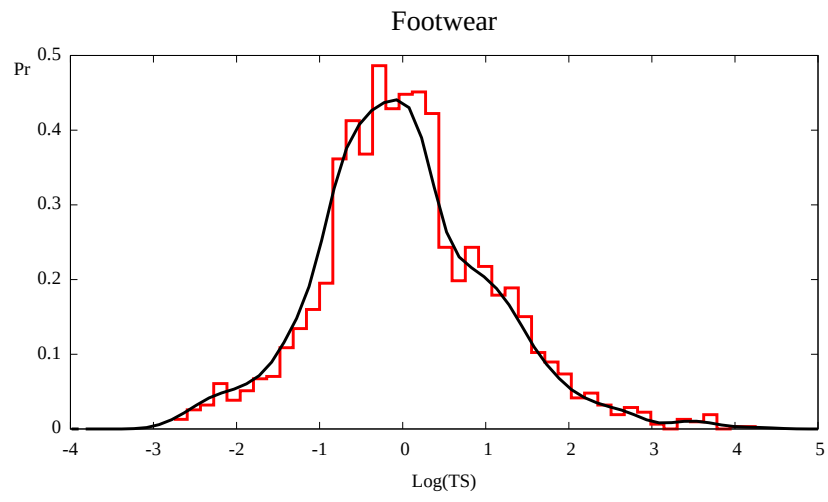




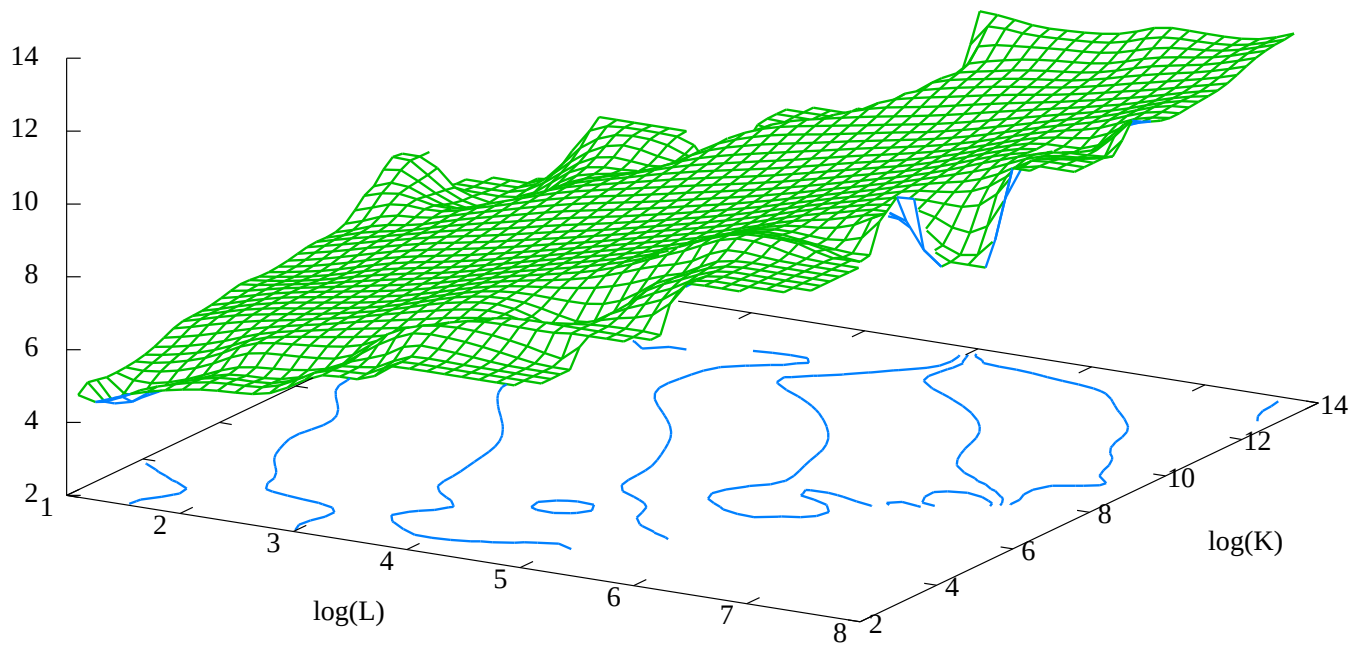




Italian manufacturing industry, 1997

Outline

VA production function



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

Single input productivity distributions

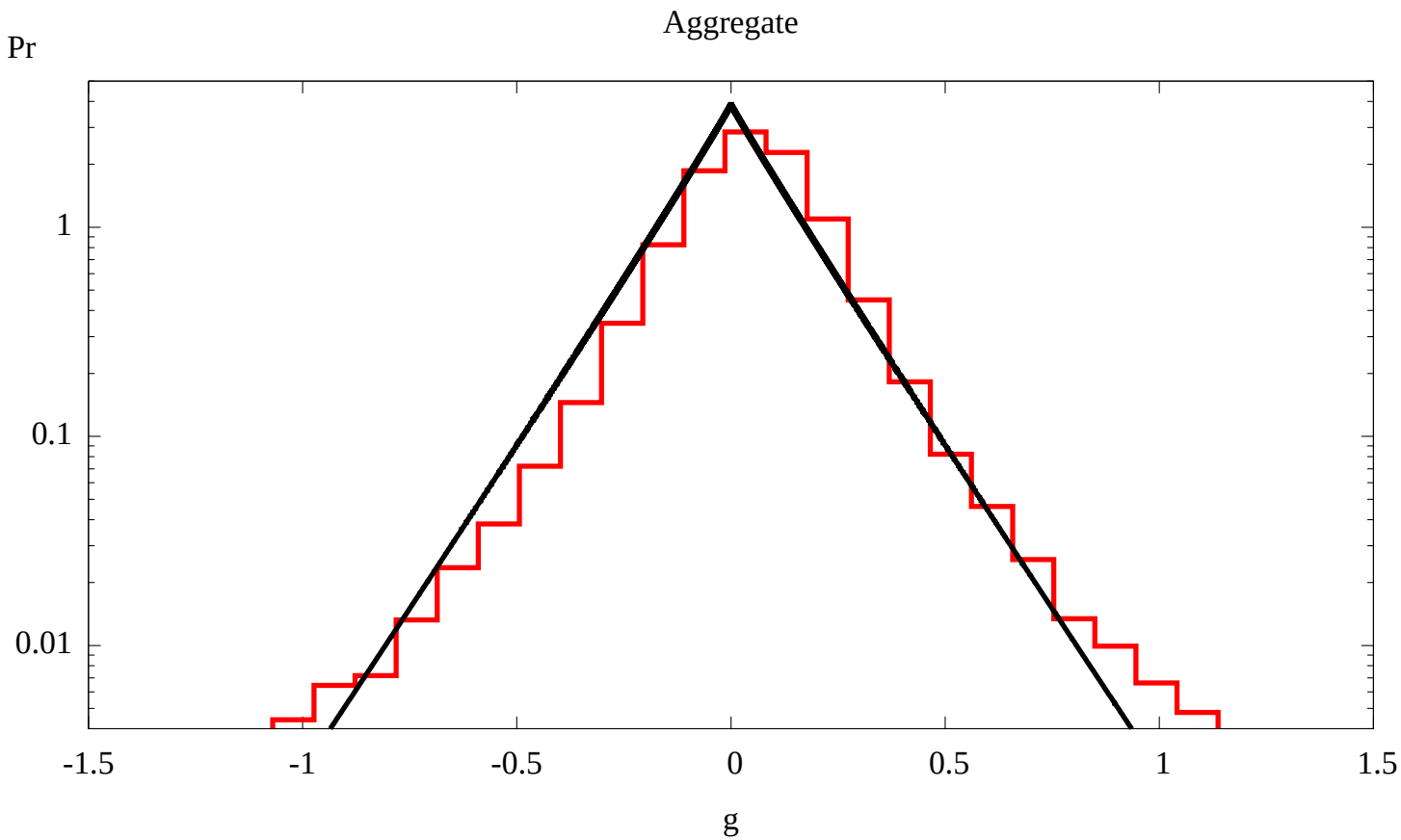
- Widespread heterogeneity again persistent over time
- We do not find evidence of a simple relation predicting that financial conditions should map on to one with efficiency in production. Two tentative interpretations.
- Results are robust to sectoral disaggregation at 2-digit level.

Outline

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:

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



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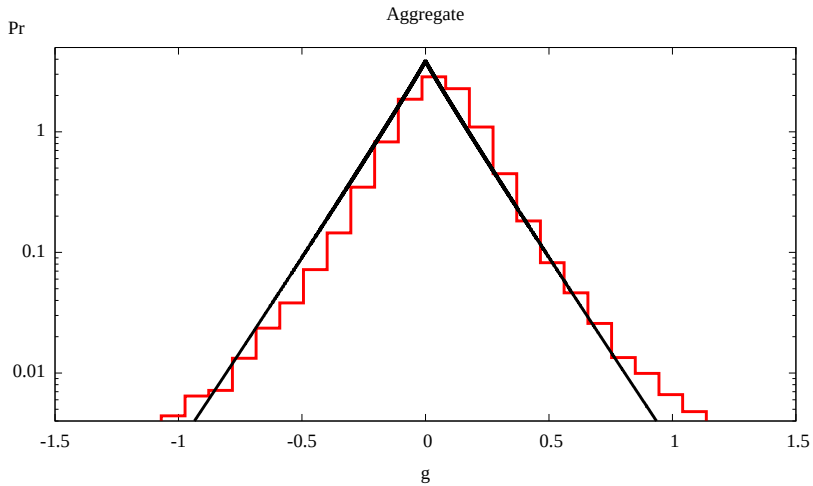

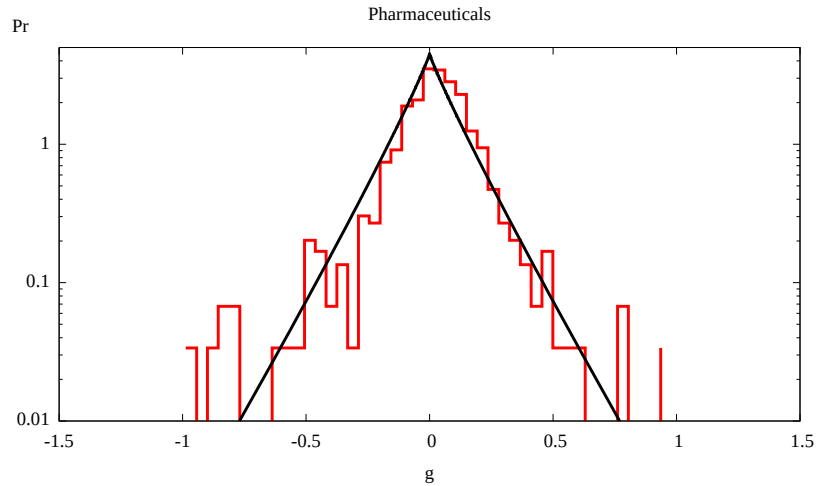

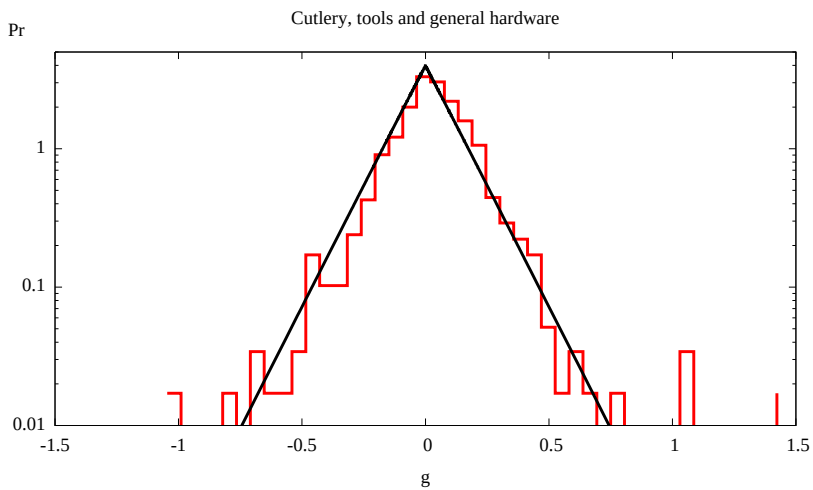

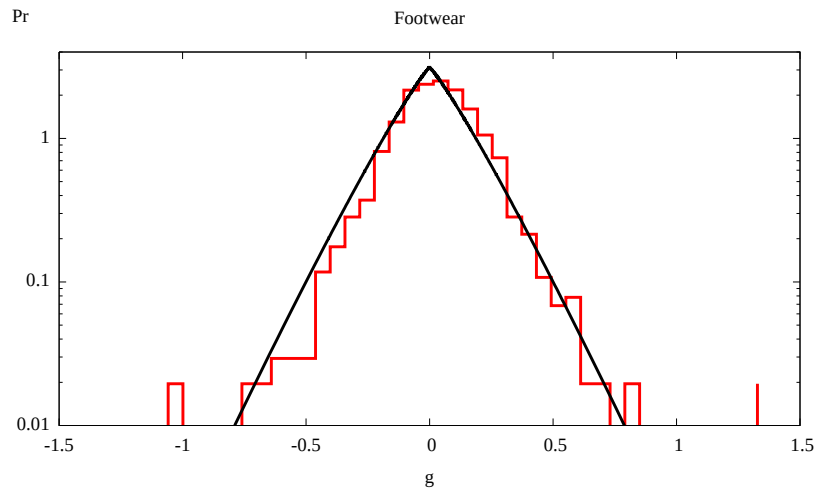

Outline

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.

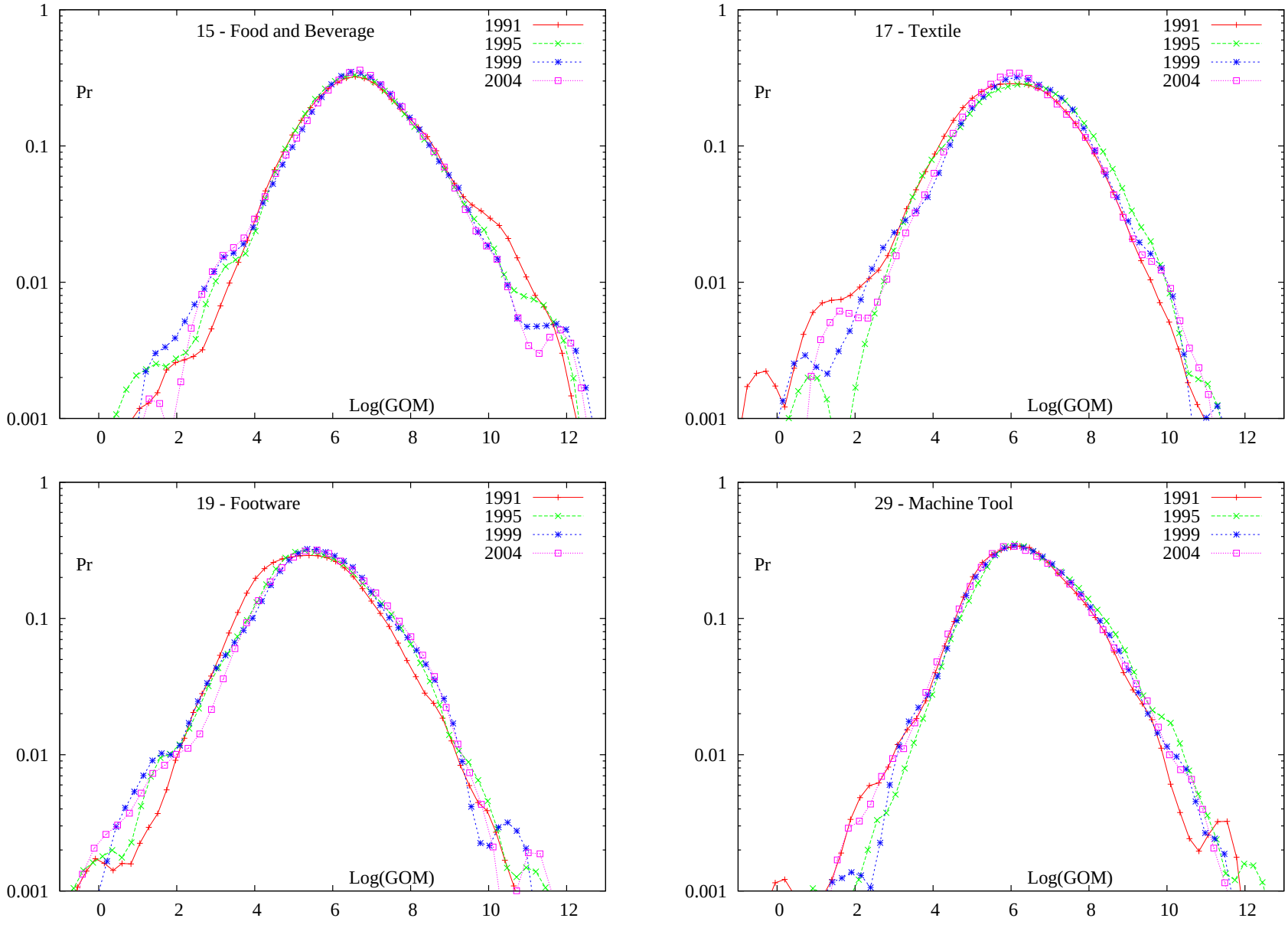

Figure: Empirical densities of (log) Gross Margin by sector. Thousands of euro, deflated with production price index. Italian data..

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

Outline

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Positive-feedback model

Observed growth as the cumulative effect of diverse "events"

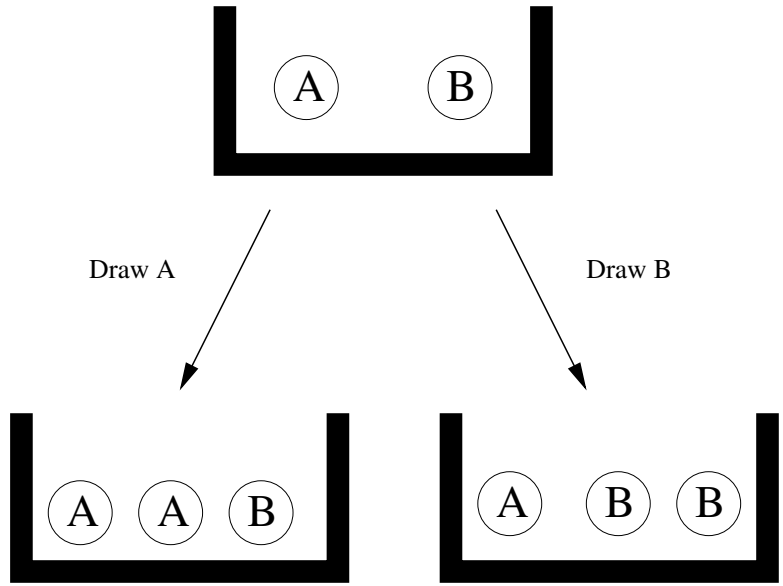
$$g(t;T) = s(t+T) - s(t) = \epsilon_1(t) + \epsilon_2(t) + \ldots = \sum_{j=1}^{G(t;T)} \epsilon_j(t)$$

- 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
2. Draw a ball and replace with TWO of the same kind. (Here the first draw from an urn with two types of ball)

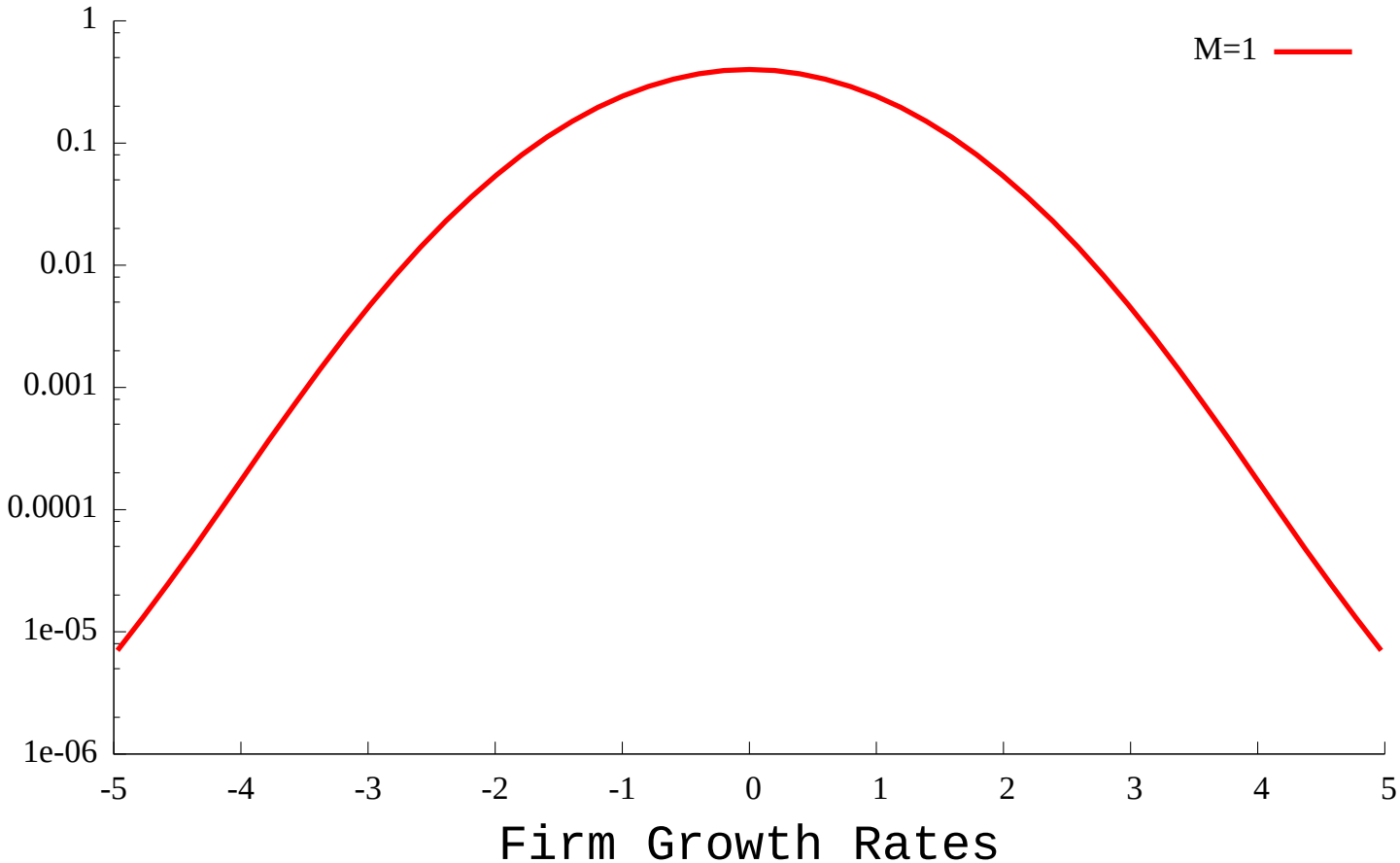


3. Repeat this procedure M times

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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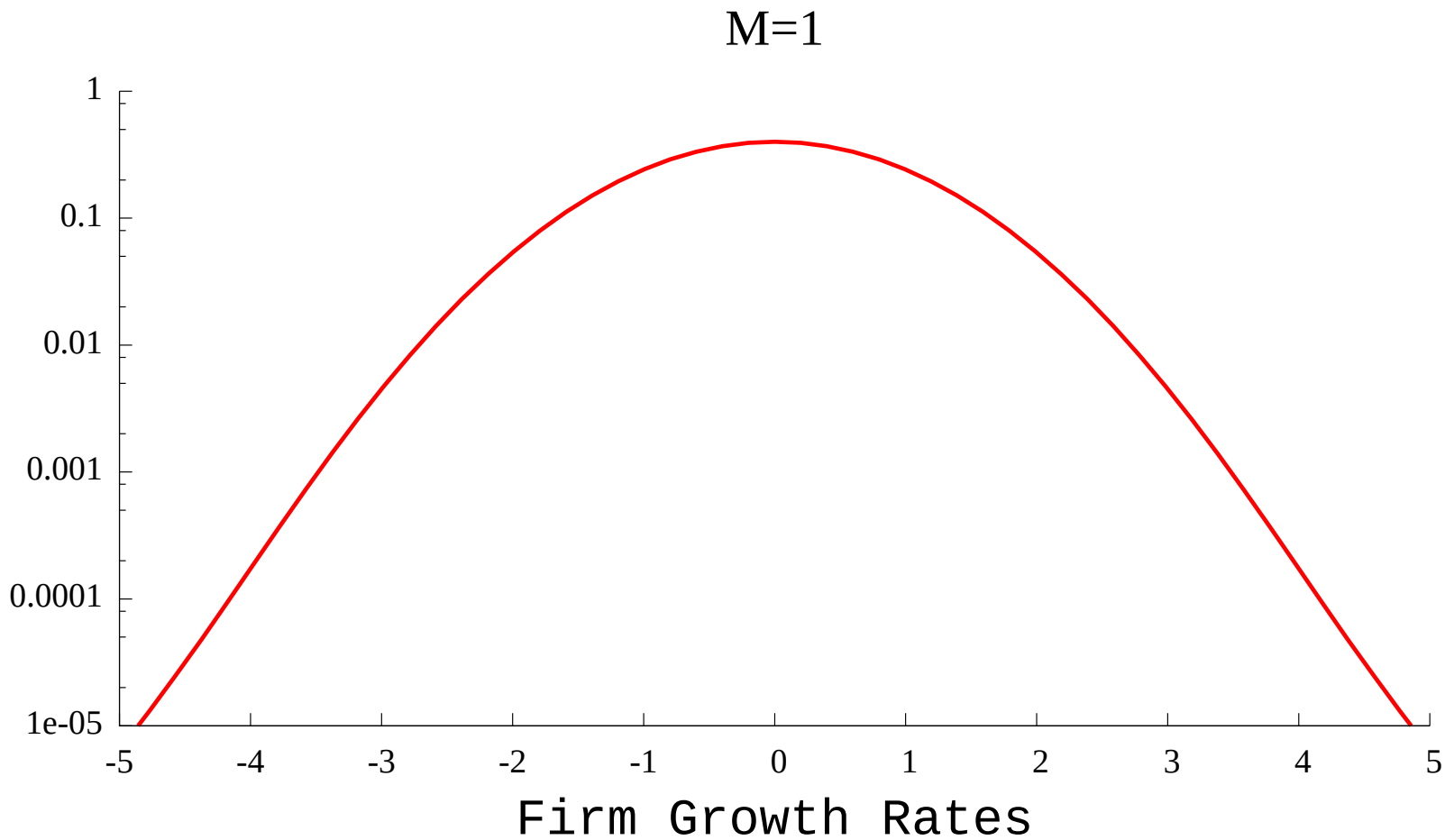

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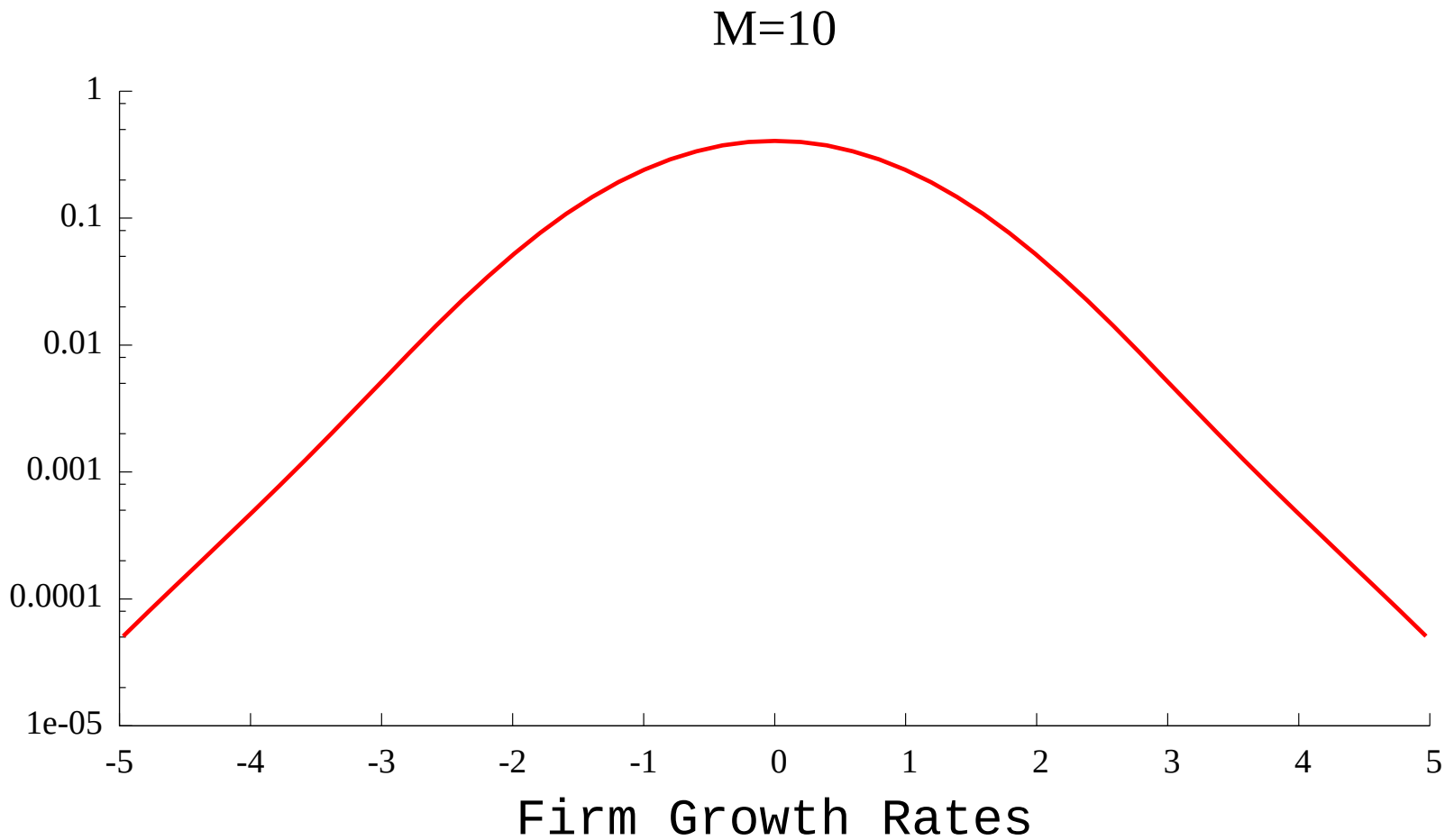

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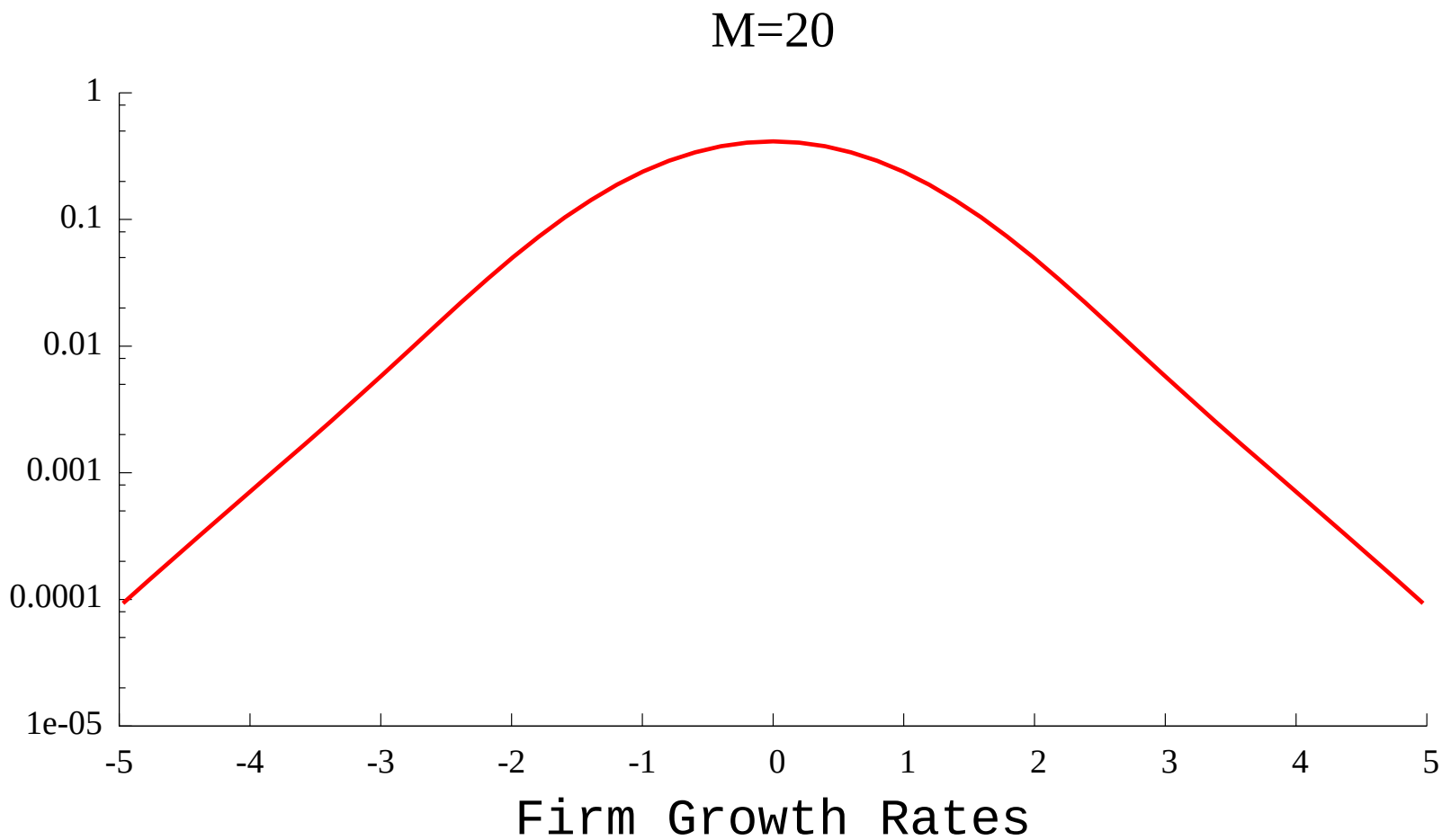

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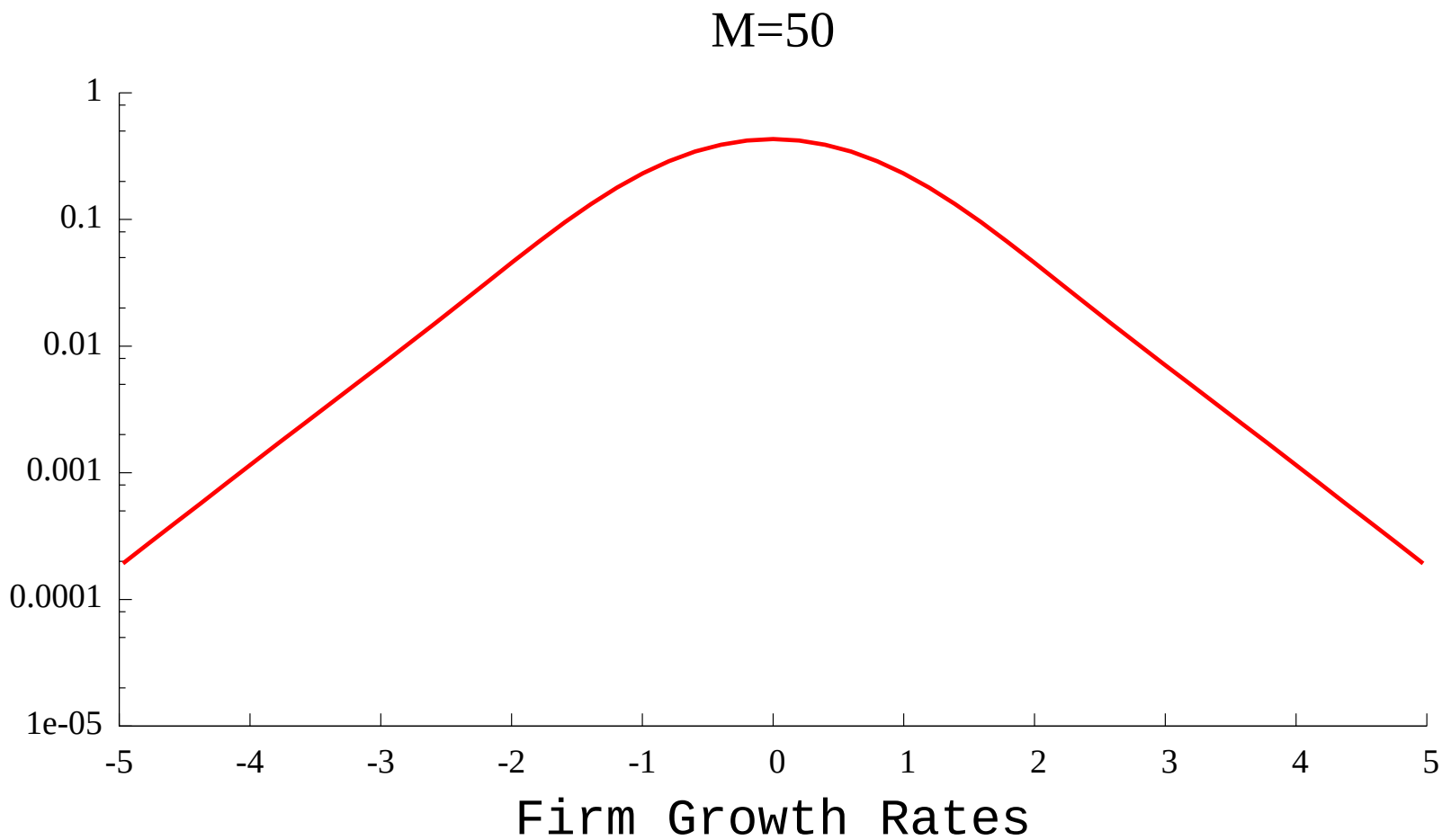

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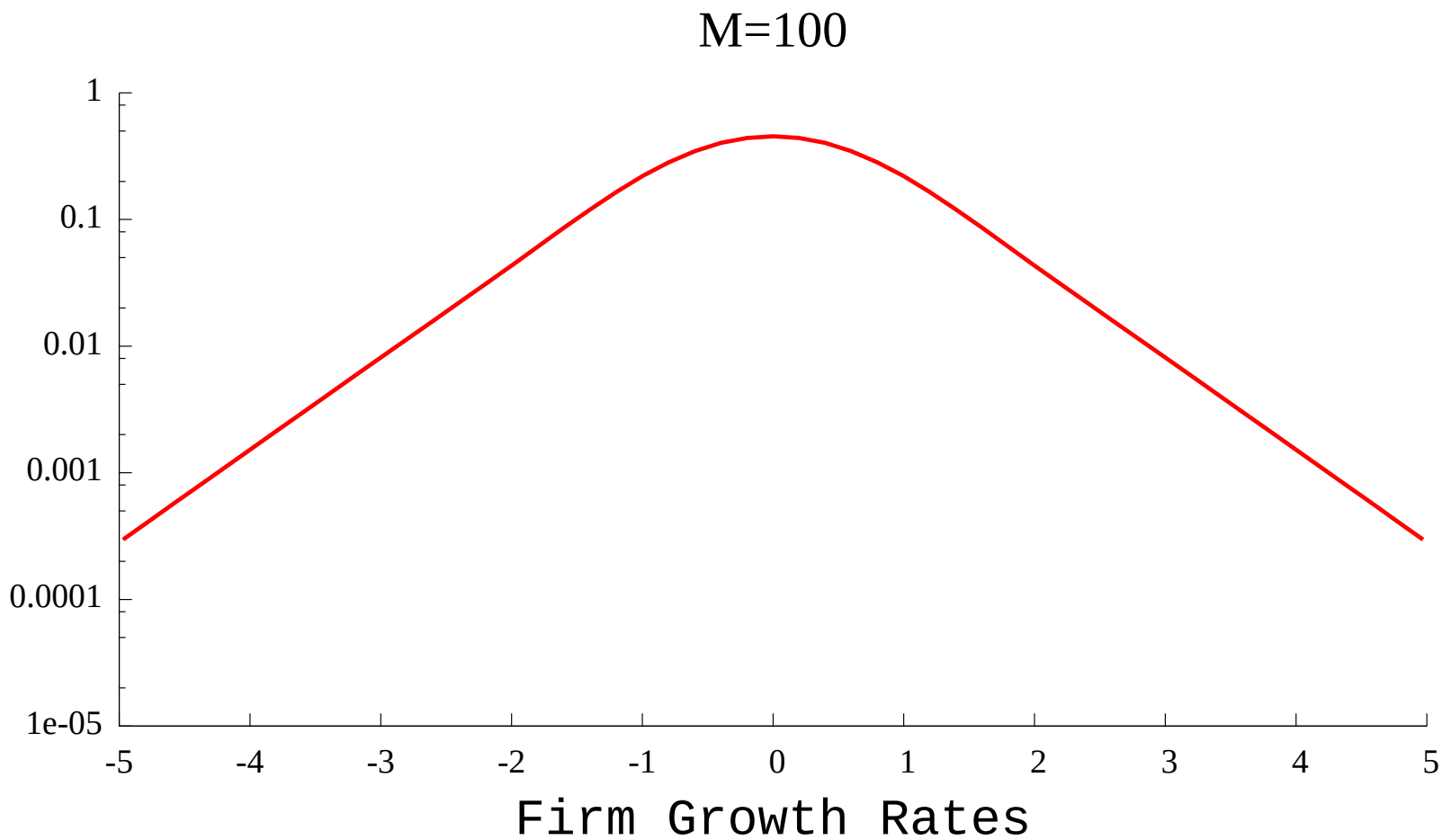

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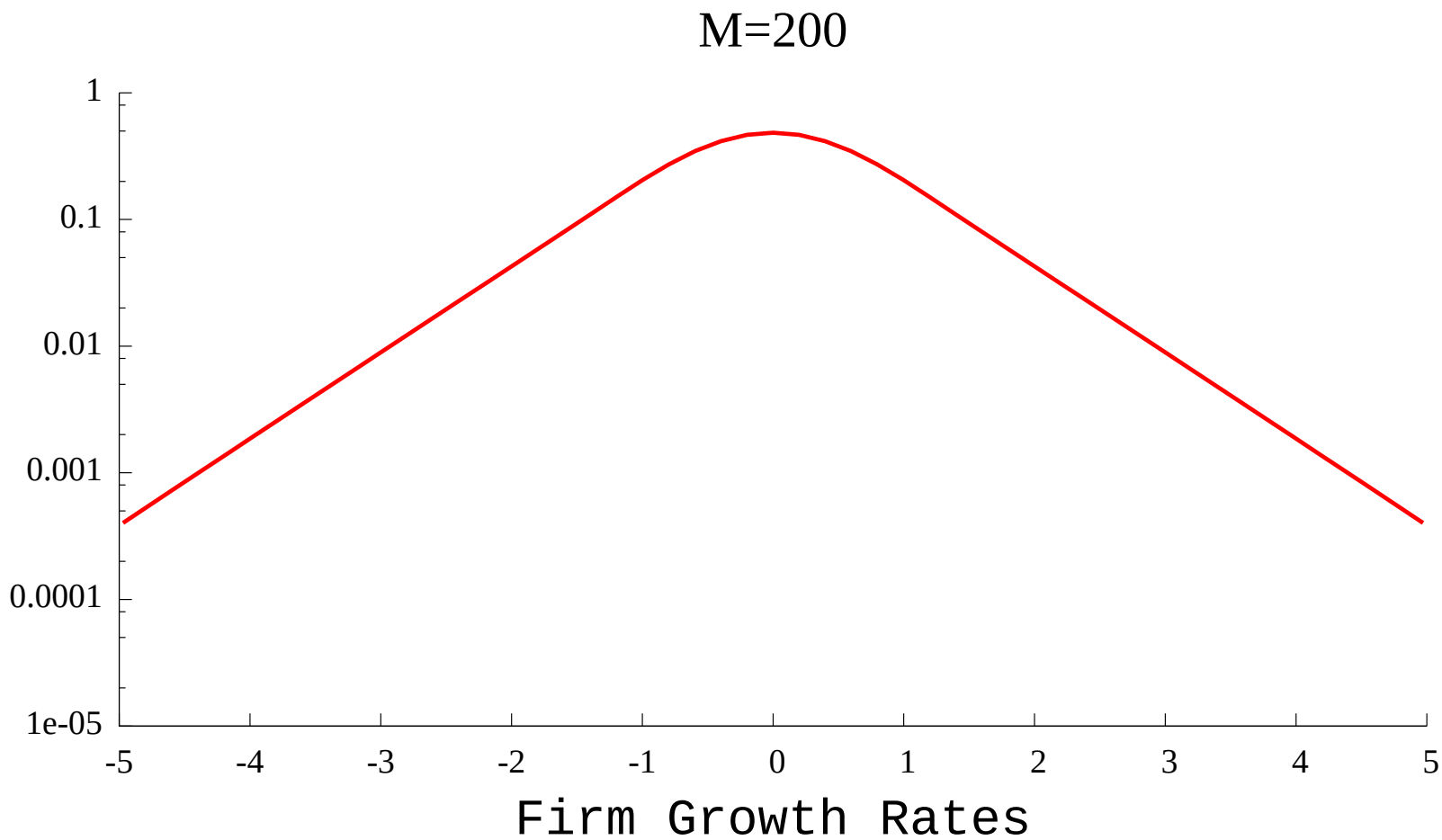

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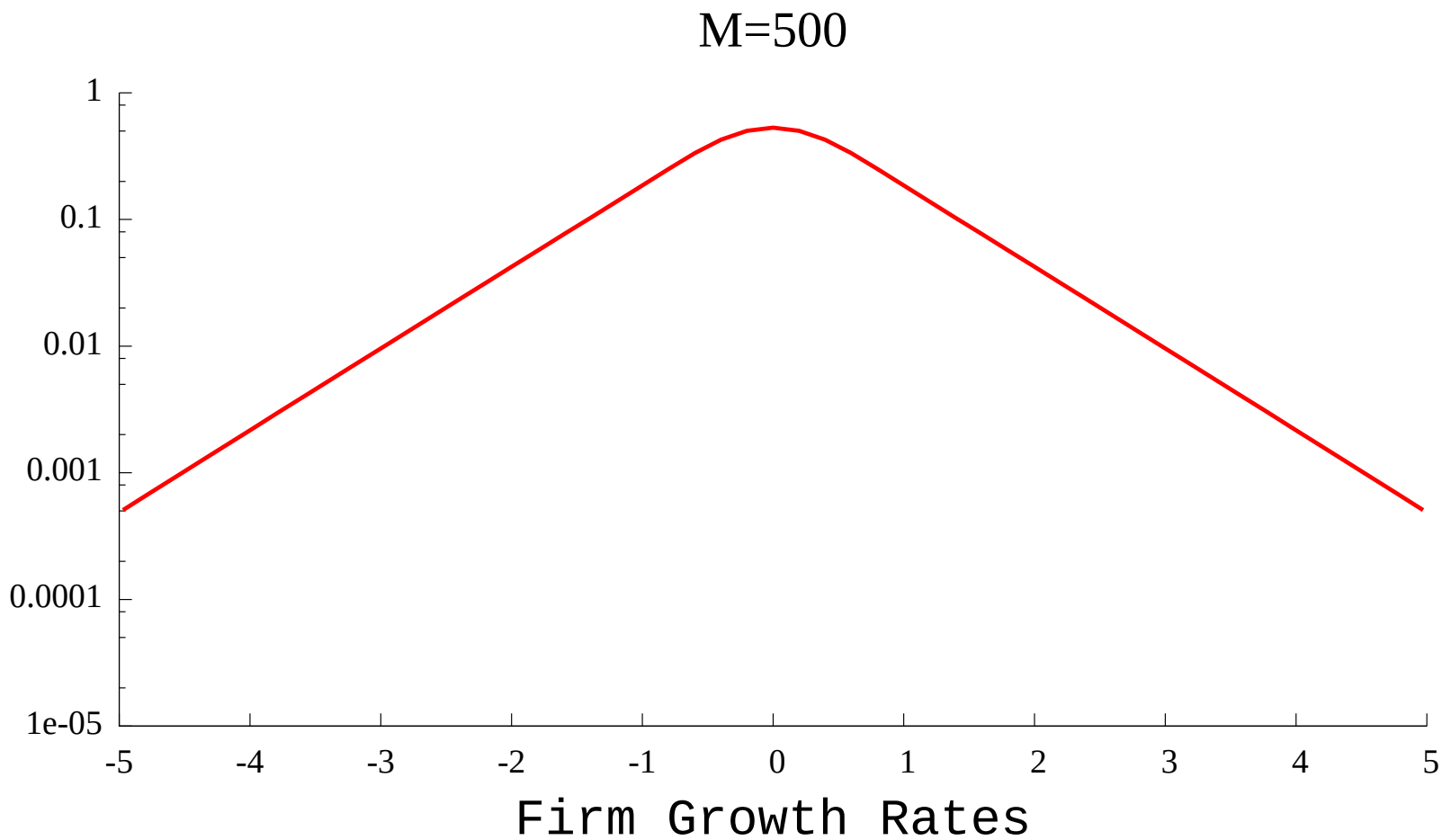

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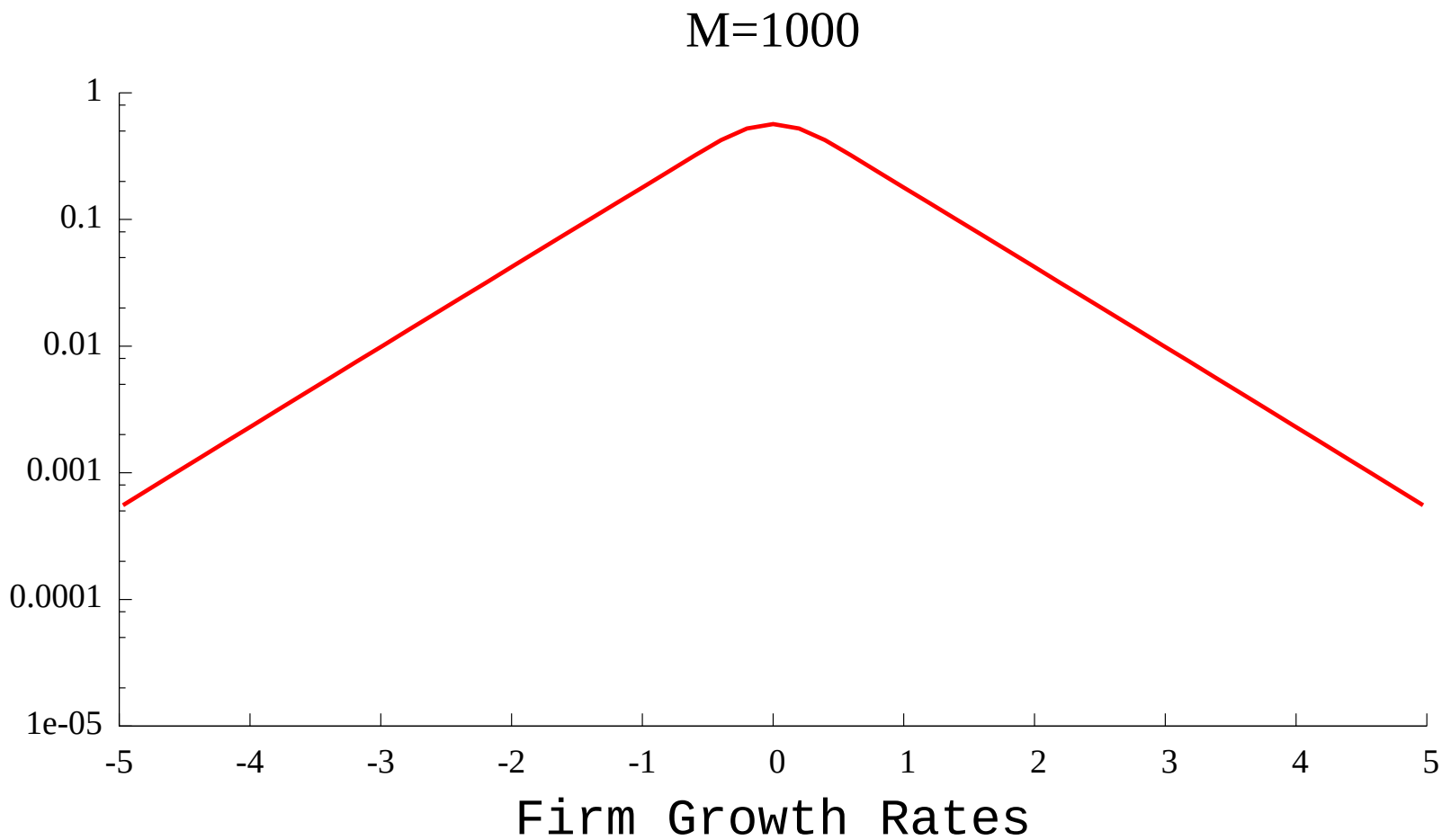

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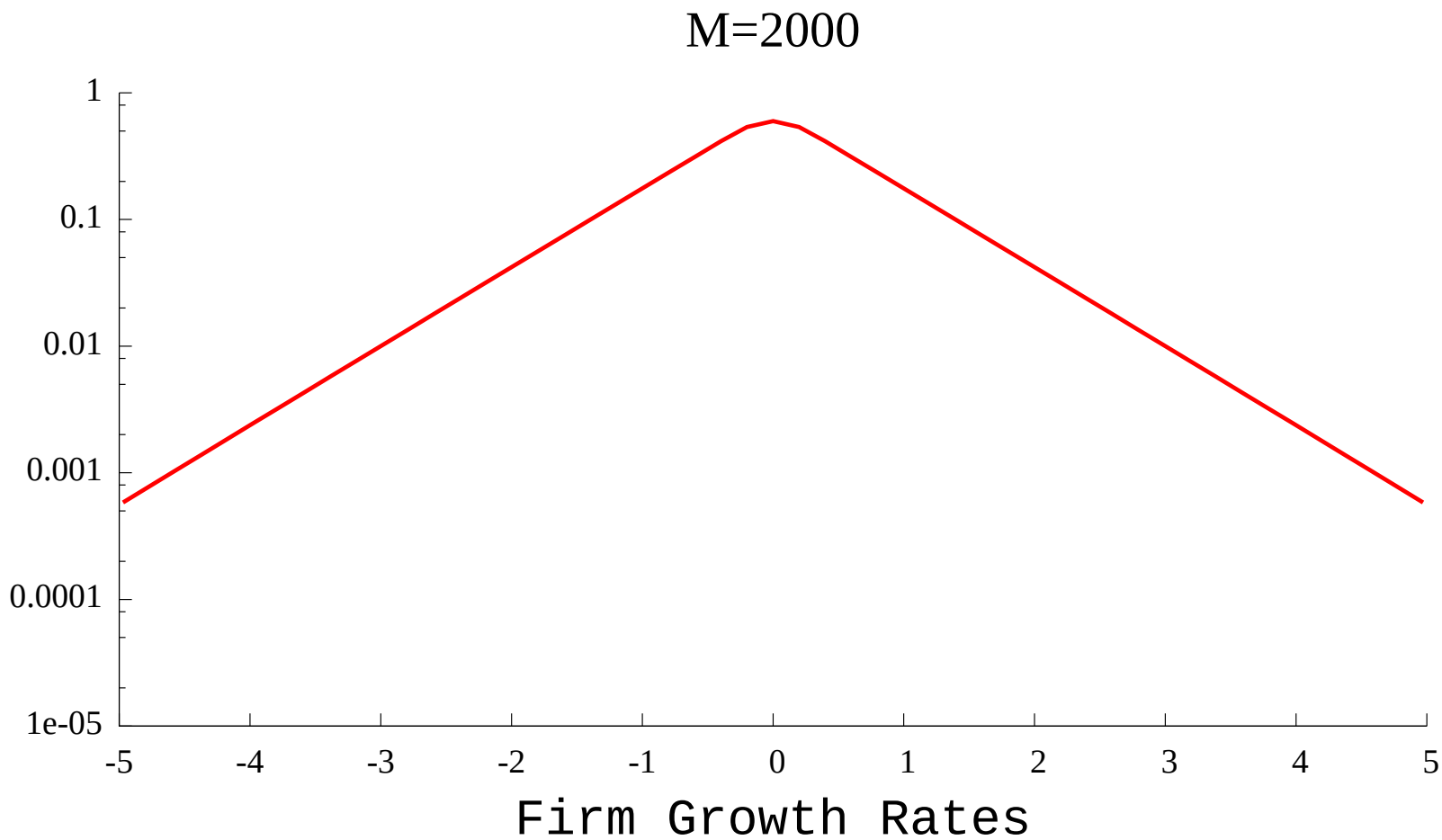

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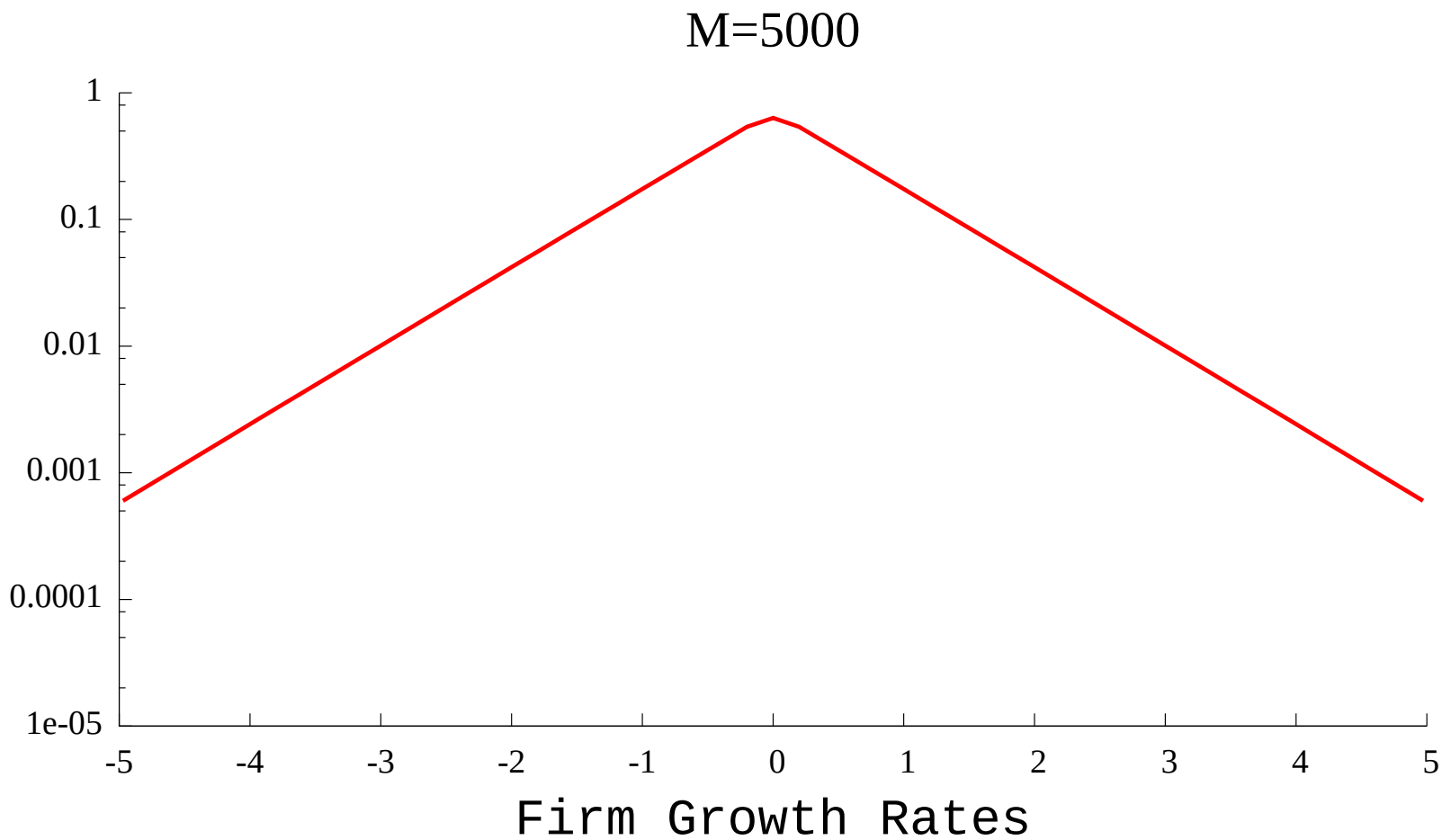

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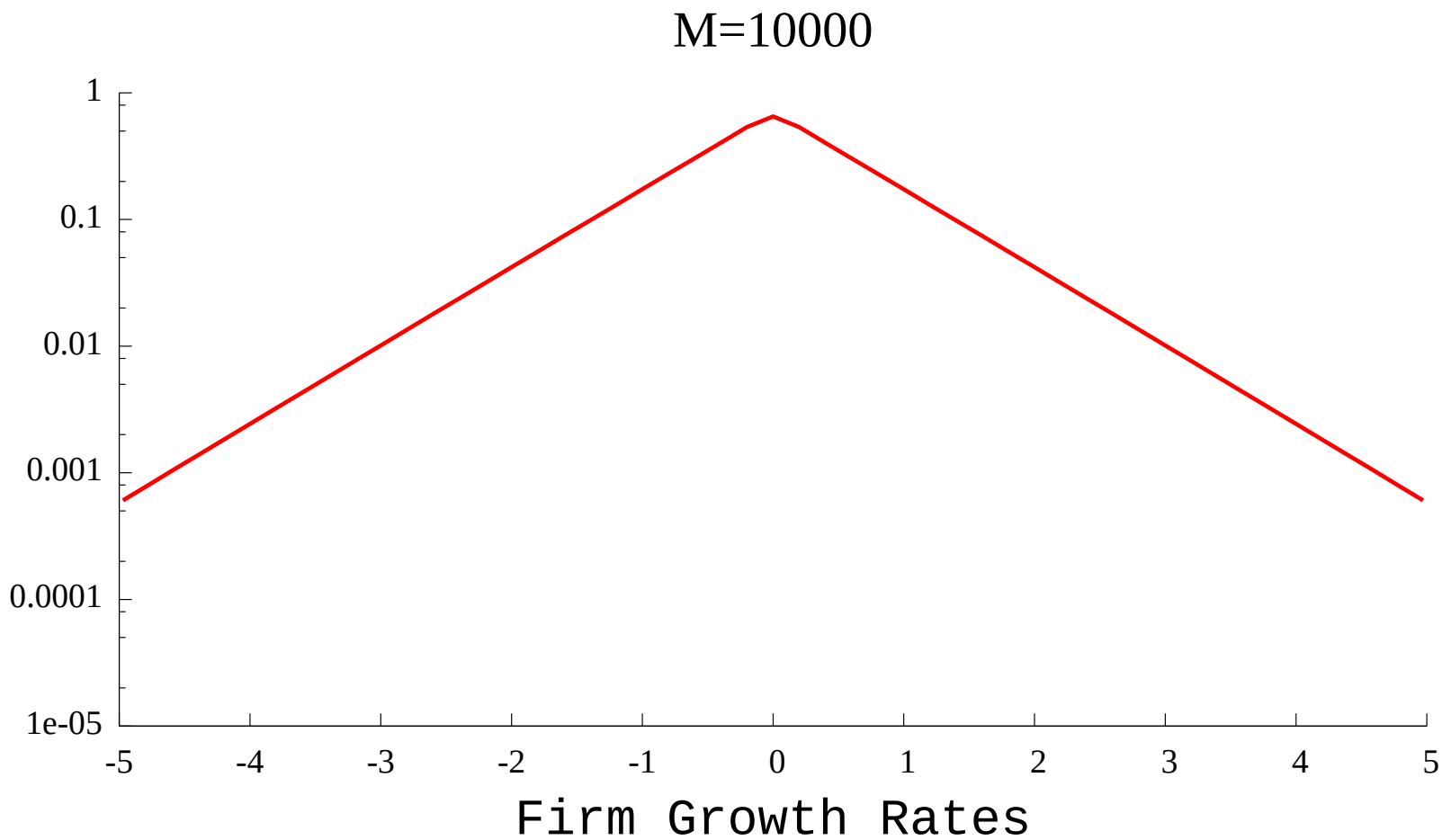

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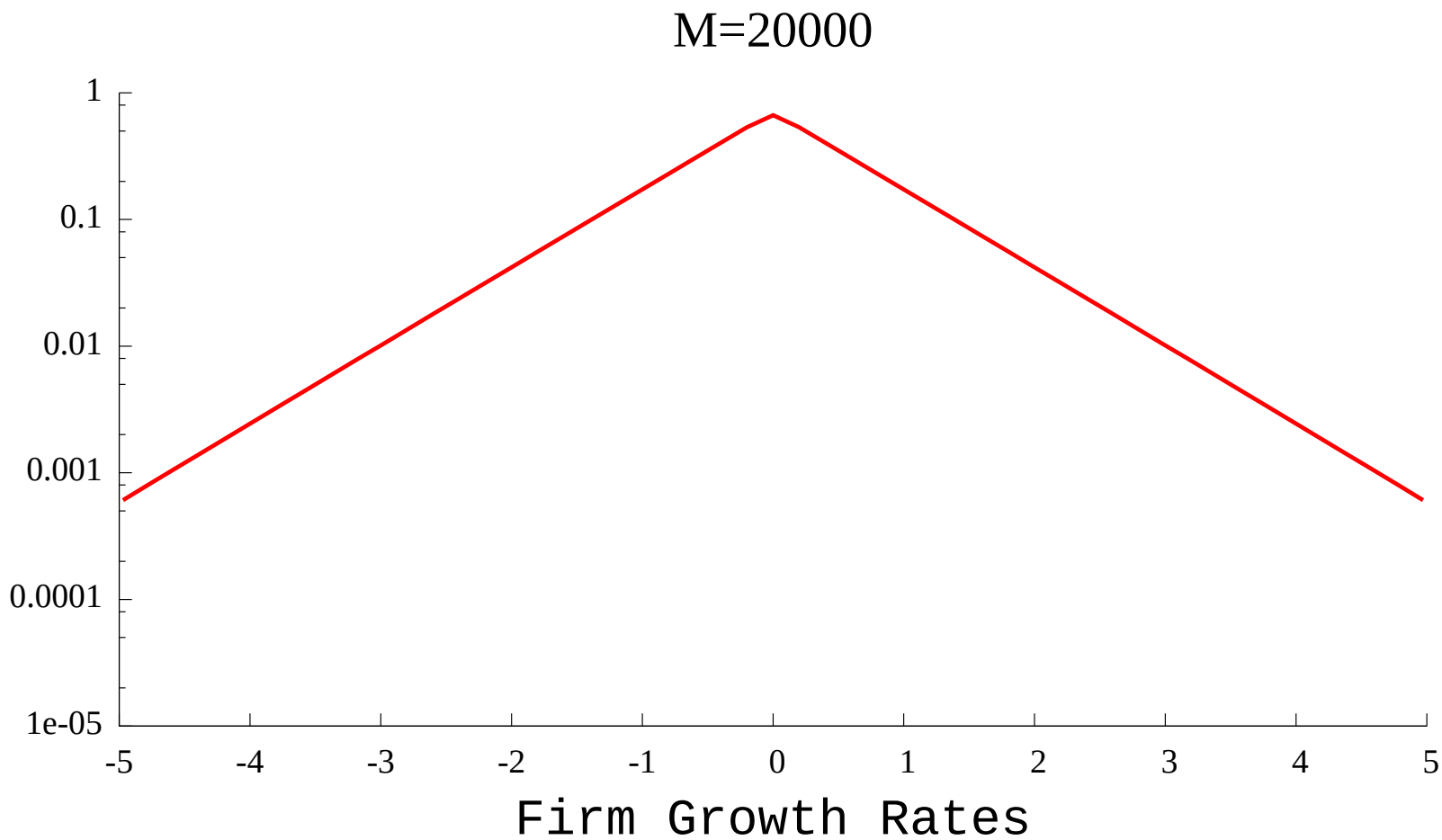

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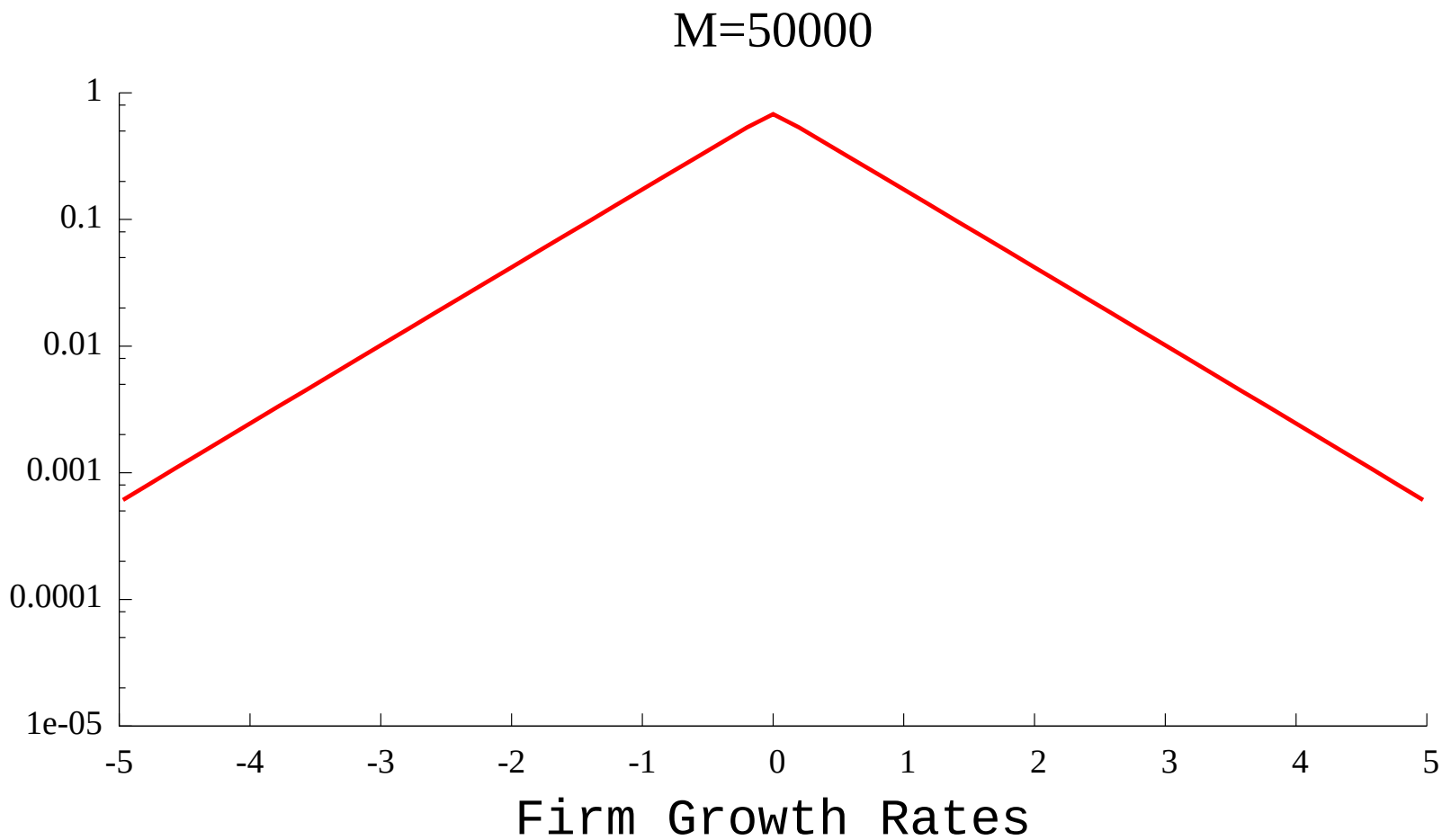

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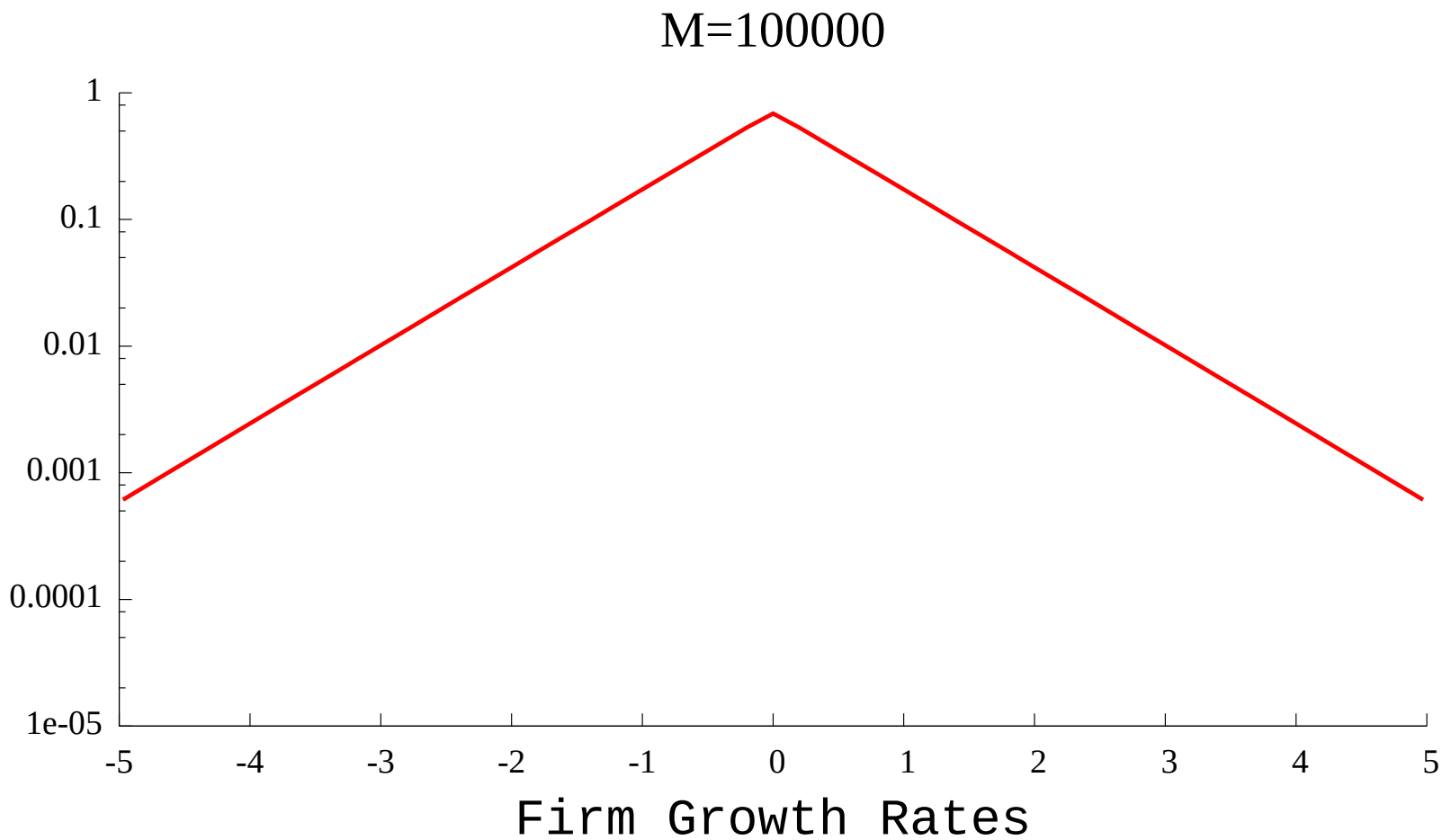

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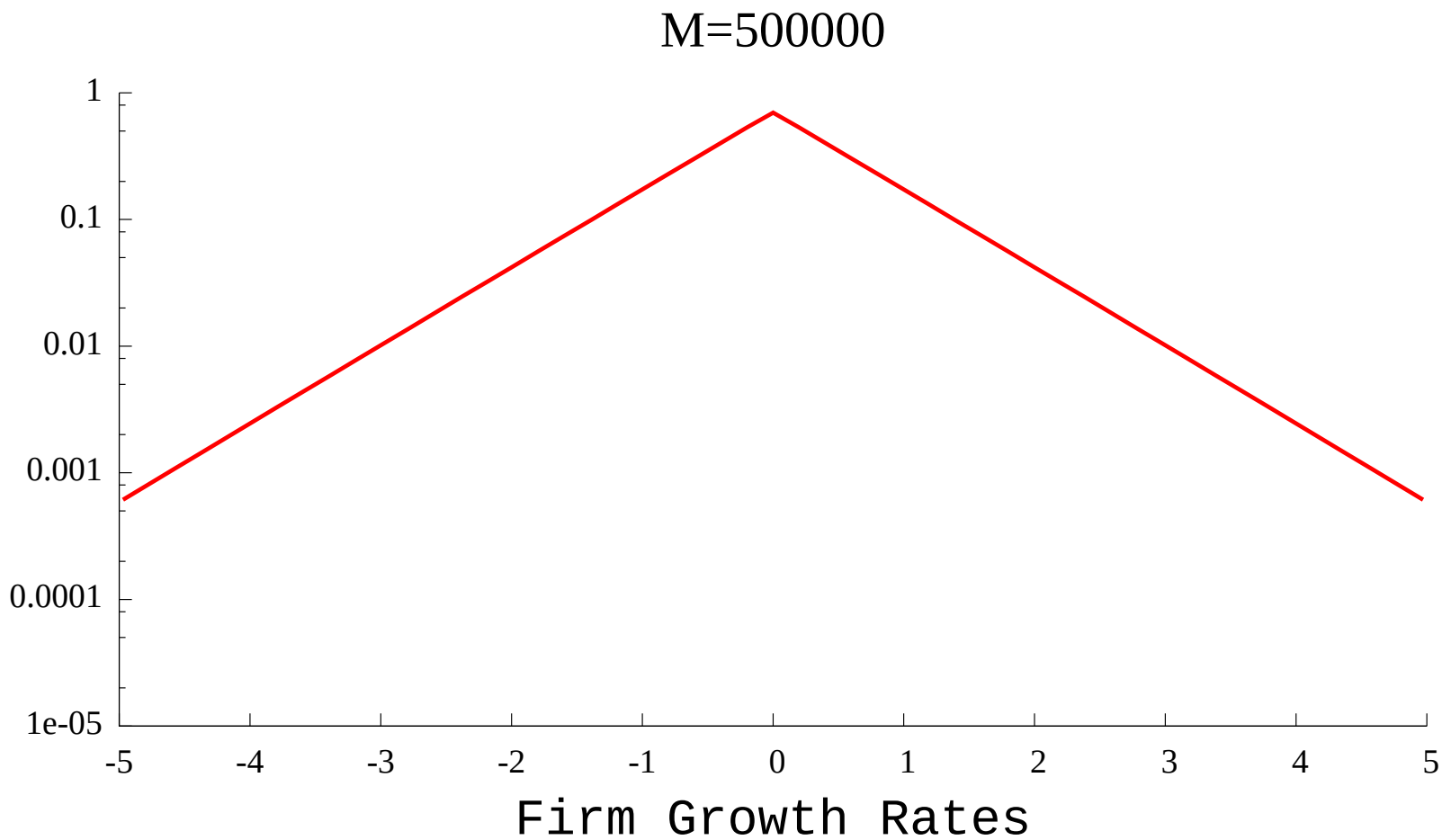
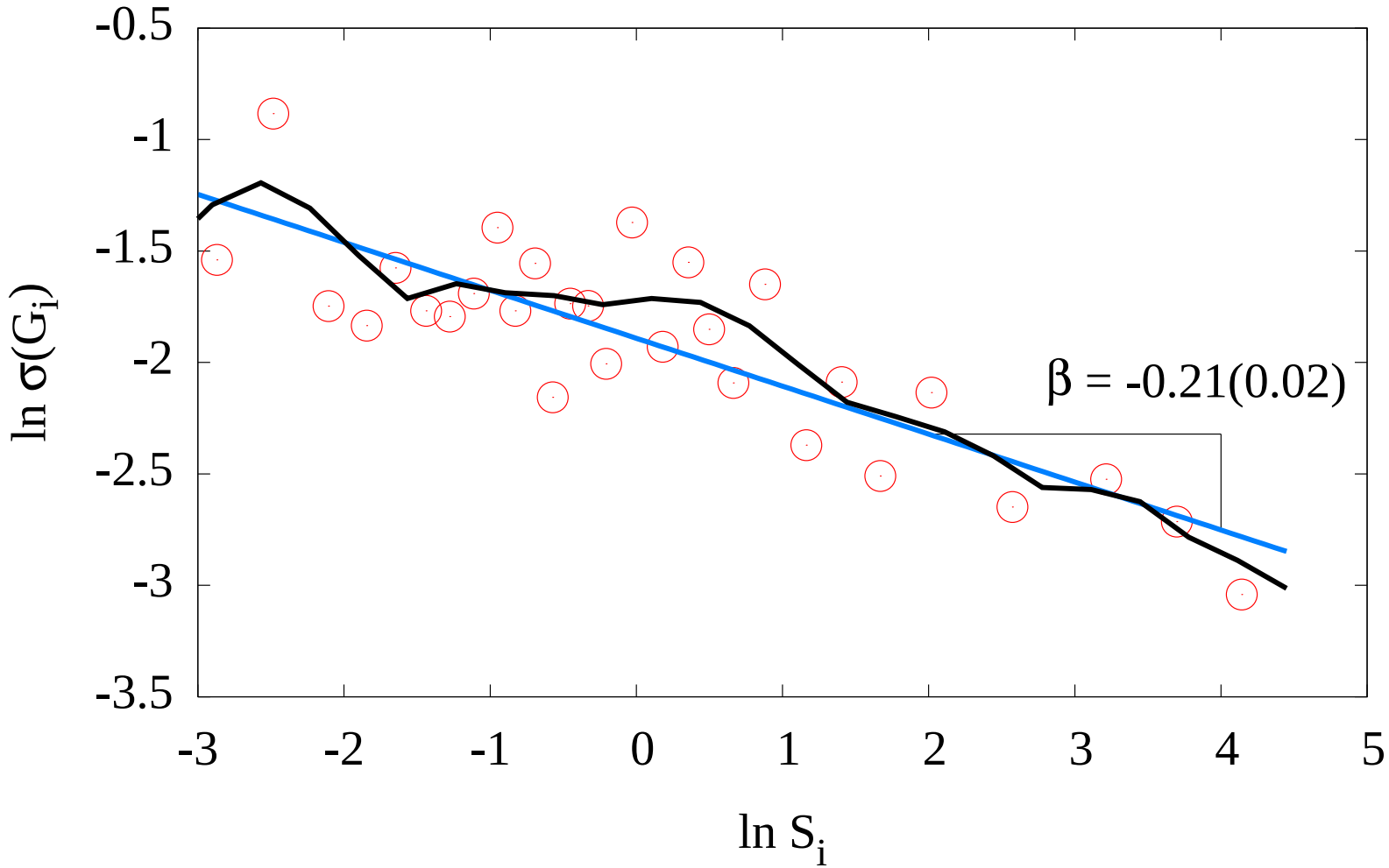


Outline

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



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

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

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

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  No observed relation with S!

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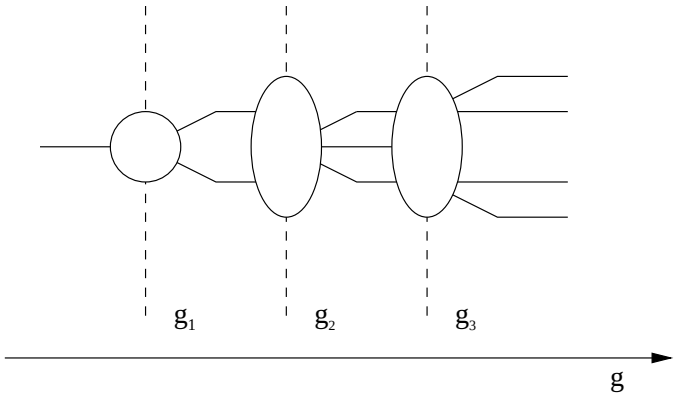
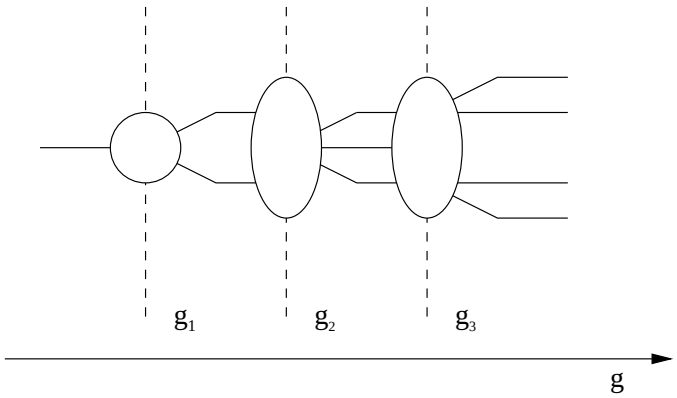
- $N_i(t)$ Diversification

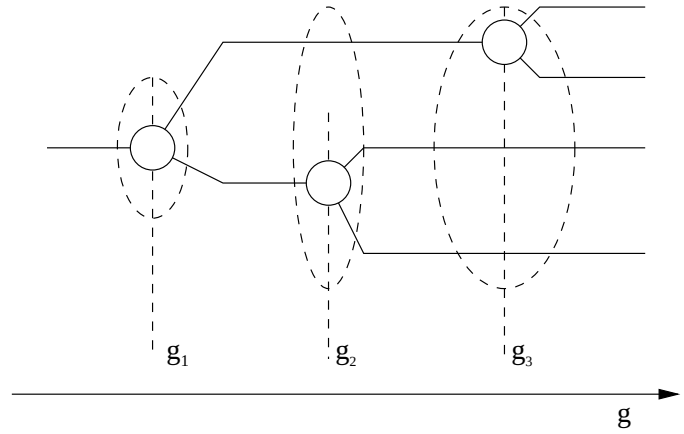
  It must have a relation with S



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

Linear relation between N and S





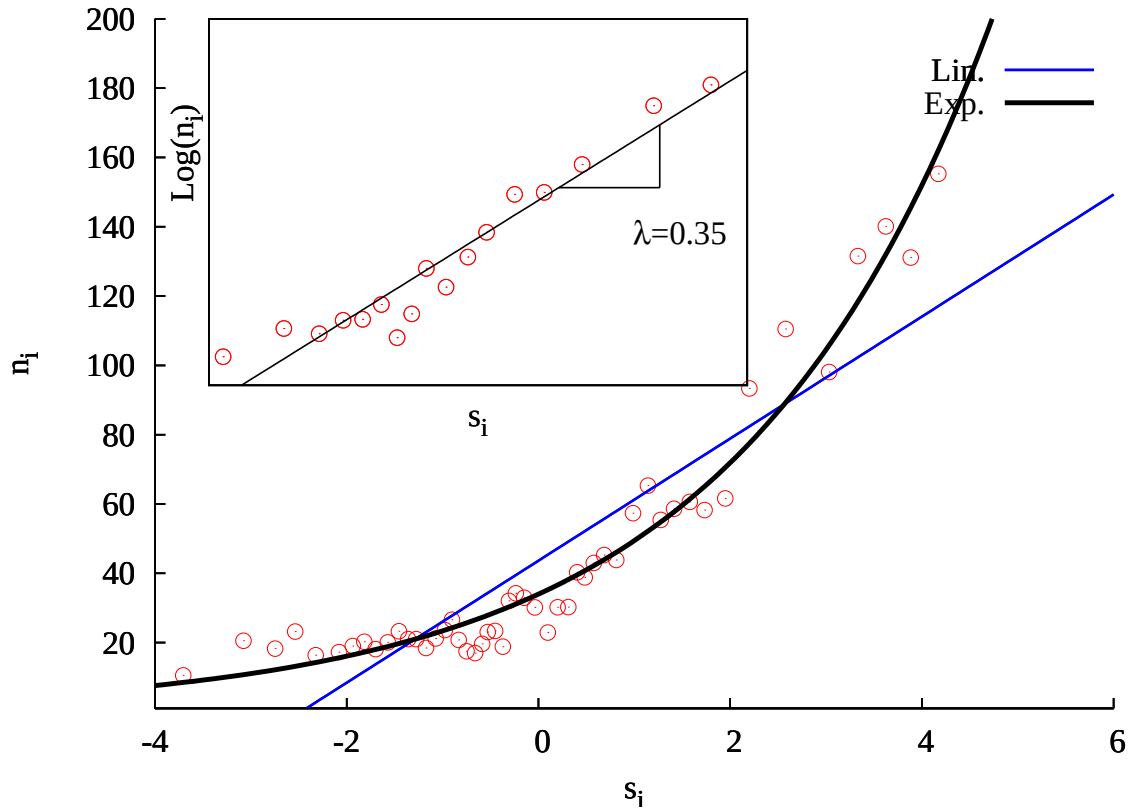
Random diversification: random arrival of independent diversification events during the firms' history

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 $\mathrm{var}_{it}[G_i(t)] \sim S_i$!

Outline

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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.