# Why Micro-Funding? Why Small Businesses Are Important?

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## 1. Formulation of the problem

- In economics, there is a known phenomenon of *economy of scale*, when a merger of two small companies helps lower the costs.
- The same phenomenon is known in all kinds of activities.
- For example, when researchers collaborate, they can usually achieve much more than when they work on their own or in small groups.
- Based on this logic, one would expect that this effectiveness leads to the dominance of big companies in economics and big well-funded projects in science.
- In practice, however, there is a stable and significant proportion of small businesses.
- This shows that there is economic benefit in having small businesses in addition to big companies.

## 2. Formulation of the problem (cont-d)

- Along the same lines, it has been empirically shown that:
  - the best way to stimulate economy
  - is to provide funding both to big and small businesses, i.e., to combine macro-funding and micro-funding.
- Similarly, when supporting science:
  - the best effect is achieved
  - when usual-size grants are supplemented by micro-funding, i.e., by smaller-size grants.
- How can we explain this phenomenon?

## 3. Formulation of the problem (cont-d)

- In economics, in science sponsorship, and in other similar areas there are good explanations for this phenomenon.
- However, the current explanations are specific to each area, while the phenomenon is the same in all these areas.
- It is therefore desirable to look for a general explanation for this phenomenon.
- In this talk, we provide such an explanation.

## 4. Our explanation

- In all such situations, we have a fixed amount of money, and we want to find the best way to distribute this amount.
- Each distribution can be naturally described by a density function $f(m)$ for which:
  - the number of grants of sizes between $m$ and $m + \Delta m$
  - is equal to $f(m) \cdot \Delta m$.
- What is the optimal function $f(m)$?
- We do not know the exact form of the objective function, all we know is that:
  - some distributions are more effective than others; we will denote it by $f(m) \succ g(m)$ – and
  - some are of the same effectiveness ($f(m) \sim g(m)$).

## 5. Our explanation (cont-d)

- It is reasonable to require that there is only one optimal function.
- Otherwise, if there were two functions of equal quality, we could use this non-uniqueness to optimize something else.
- It is also reasonable to require that the relation $f(m) \succ g(m)$:
  - should not depend on what units we choose for counting money,
  - be it dollars, euros, or Mexican pesos.
- When you change a unit of money, then the original amount $m$ becomes $\lambda \cdot m$ for some constant $\lambda$.
- So, we require that $f(m) \succ g(m)$ imply $f(\lambda \cdot m) \succ g(\lambda \cdot m)$.
- It turns out that under these requirements, the optimal function is the power law $f(m) = C \cdot m^\alpha$ for some $C$ and $\alpha$.

## 6. Our explanation (cont-d)

- Each power law function is everywhere positive.
- So in the optimal arrangement, we should always have some grants with small $m$.
- This explains the ubiquity and effectiveness of micro-funding.

## 7. References


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