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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