Network Effects and Learning in Crowdfunding

Paul Belleflamme, Thomas Lambert, and Armin Schwienbacher
Digital platforms

Represent an increasing share of the global economy

Do not control transactions but simply enable them

Critical for digital platforms to overcome:

1. Coordination problems ⇒ Network effects (‘payoff externalities’)
2. Asymmetric information problems ⇒ Learning (‘informational externalities’)

Little systematic empirical evidence exists on their incidence
This paper

Goal

- We study how the interplay between network effects and learning shapes the performance of crowdfunding platforms (CFPs)

Findings

1. We confirm the existence of positive ‘within-project funding dynamics’
2. We show the existence of positive ‘cross-project funding dynamics’
3. Recurrent backers are the main transmission channel
   - They are better at spotting successful projects
   - They encourage future funding by other backers
Why care?

Implications for CFP management

- Success of a CFP depends not only on the **quality** and **quantity** of projects but also on their **mix** (synergies between projects)
- Recurrent backers behave quite differently from new backers

Implications for CFP competition

Forces leading to **concentration**
- Positive cross-project dynamics
- Positive within-project dynamics

Forces leading to **coexistence of platforms**
- Negative cross-project dynamics
- Negative within-project dynamics
Network effects in crowdfunding

Payoffs that users derive depend on the adoption and usage decisions of other users (hence ‘payoff externalities’).
Learning in crowdfunding

Individual learning
• Influence occurring independently of any social influences (e.g., trial and error, insight)

Social learning
• Influence resulting from rational processing of information gained by observing others (Bikhchandani, Hirshleifer, and Welch 1998)
• A.k.a. ‘informational externalities’

Interdependence is inherently dynamic
• Within and across crowdfunding campaigns
Testable hypotheses

H1. Within-project funding dynamics? Complement to existing studies

H2. Cross-project funding dynamics? NEW ISSUE!

H3. Individual learning by recurrent backers?

H4. Social learning by new backers?
ULULE: Reward-based CFP

- Why a reward-based CFP and not an equity-based CFP?
  - Larger number of campaigns running simultaneously
- Why a (smaller) French CFP and not a (larger) U.S. CFP?
  - Deficit in size/notoriety compensated by richness of data

What we observe

- 23,971 campaigns posted on the platform from 05/07/2010 (opening day) to 29/11/2016, in 15 categories
- All 1.3 million of contributions to these campaigns + when (date/time), how much and by whom

What we can track

- Funding dynamics (within and across projects)
- Backers’ behavior
Sample statistics

Large variation of number of contributions across days and projects
- Average number of daily contributions per project: 1.6
- Significant dispersion: standard deviation of 9.5

Variation in the amounts contributed
- Average daily contribution for a specific project is €79.90
- Median of €5, standard deviation of €521
- Average daily total contribution (platform level) is almost €50,000 (from over 900 contributions)

Importance of recurrent backers
- Average proportion per project per day: 12.7%.
- Larger share for ‘Games’ (29.5%) and ‘Comics’ (25.4%)
Within- and cross-project dynamics

\[ y_{ijt} = \alpha_i + \alpha_t + \beta_1 Y_{i,t-1} + \beta_2 Y_{-i,t-1} + \beta_3 Y_{-j,t-1} + \gamma X_{i,t-1} + \epsilon_{it} \]

- **Number of contributions** received by project \( i \) of category \( j \) on date \( t \)
- **Project FE**
- **Time FE**

**Within-project dynamics**

**Cross-project dynamics**

- **Number of contributions** received by project \( i \), by other projects in \( i \)'s category, by projects outside \( i \)'s category on date \( t-1 \)
- **Vector of control variables** (time-varying project characteristics: #projects, %goal, Popular, %recurrent backers)
- **Error term**
### Baseline estimations

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<thead>
<tr>
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<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
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</thead>
<tbody>
<tr>
<td>$\beta_1$ # contributions$_{i,t-1}$</td>
<td>0.185***</td>
<td>0.183***</td>
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<td>(0.002)</td>
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<td>$\beta_2$ # contributions$_{i,t-1}$</td>
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<td>0.013***</td>
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<td>(0.002)</td>
<td>(0.002)</td>
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<tr>
<td>$\beta_3$ # contributions$_{j,t-1}$</td>
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<td>0.047***</td>
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<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
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<tr>
<td># projects$_{i,t}$</td>
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<td>-0.024***</td>
<td>-0.029***</td>
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<td>(0.007)</td>
<td>(0.009)</td>
<td>(0.008)</td>
<td>(0.007)</td>
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<tr>
<td>% goal$_t$</td>
<td>0.286***</td>
<td>0.369***</td>
<td>0.368***</td>
<td>0.284***</td>
</tr>
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<td></td>
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<td>(0.007)</td>
<td>(0.007)</td>
<td>(0.006)</td>
</tr>
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<td>Popular$_t$</td>
<td>1.161***</td>
<td>1.252***</td>
<td>1.253***</td>
<td>1.163***</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.012)</td>
<td>(0.012)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>% recurrent backers$_t$</td>
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<td>0.675***</td>
<td>0.674***</td>
<td>0.661***</td>
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<tr>
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<td>(0.002)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.002)</td>
</tr>
<tr>
<td># observations</td>
<td>814,960</td>
<td>814,960</td>
<td>814,960</td>
<td>814,960</td>
</tr>
<tr>
<td># projects</td>
<td>23,022</td>
<td>23,022</td>
<td>23,022</td>
<td>23,022</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.548</td>
<td>0.529</td>
<td>0.529</td>
<td>0.548</td>
</tr>
</tbody>
</table>

**Fixed effects:** Project, Month, Year, Day of the week, Funding cycle day day
Evidence of positive within- and cross-project funding dynamics

- A 10% increase in # contributions to project $i (-i, -j)$ yesterday leads to a:
  - 1.76% increase in # contributions to project $i$ today
  - 0.12% increase in # contributions to project $i$ today
  - 0.45% increase in # contributions to project $i$ today

Impacts of control variables

- Enhanced competition for pledges among entrepreneurs
- Goal-gradient effect: #contributions higher close to funding goal
- Projects featured on Ulule’s first page generate more contributions
- Recurrent backers seem to generate larger within-group network effects
Further tests

Categories

• Some categories generate relatively more cross-project dynamics than other categories
  • E.g. ‘Music’ or ‘Art & Photos’ > Average > ‘Games’

Robustness

• Similar results when considering instead:
  • Volume of contributions (€ - amount)
  • Data from another platform (KissKissBankBank)
Identifying cross-project dynamics

Identification strategy
• Fast starters = campaigns generating a very large number of contributions during their first day
• Largely unexpected by backers or platform managers
• Plausibly exogenous in our campaign sample
• Confirmed by absence of media coverage prior to campaign launch (Factiva search)

Main result
• The day a project attracts more than 200 contributions, this leads to a 3.87% increase in the number of contributions a particular project gets
## Diff-in-diff estimations

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<td>Fast start_t</td>
<td>0.013***</td>
<td>(0.004)</td>
<td>0.021***</td>
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<td>Fast start_{j,t} [1]</td>
<td>0.038**</td>
<td>(0.015)</td>
<td>0.044**</td>
<td>(0.022)</td>
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<td>Fast start_{j,t} [2]</td>
<td>0.011**</td>
<td>(0.004)</td>
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<td>[0.2803]</td>
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<tr>
<td>Project Fixed Effects</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Month Fixed Effects</td>
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<td>Yes</td>
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<td>Yes</td>
</tr>
<tr>
<td>Day of week Fixed Effects</td>
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<td>Yes</td>
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<tr>
<td>Funding cycle day Fixed Effects</td>
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<td>Yes</td>
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<td>813,983</td>
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<td>814,585</td>
<td>814,585</td>
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<td># projects</td>
<td>22,995</td>
<td>22,995</td>
<td>23,011</td>
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<tr>
<td>R²</td>
<td>0.518</td>
<td>0.518</td>
<td>0.523</td>
<td>0.523</td>
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## New backers vs. recurrent backers

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<tr>
<td>'New' Fast start&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-0.006 (0.007)</td>
<td>-0.013 (0.013)</td>
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<tr>
<td>'New' Fast start&lt;sub&gt;j,t&lt;/sub&gt; [1]</td>
<td>-0.006 (0.026)</td>
<td>0.025 (0.043)</td>
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<td>'New' Fast start&lt;sub&gt;j,t&lt;/sub&gt; [2]</td>
<td>-0.007 (0.007)</td>
<td>-0.018 (0.014)</td>
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<td>'Recurrent' Fast start&lt;sub&gt;t&lt;/sub&gt;</td>
<td>0.020*** (0.007)</td>
<td>0.043*** (0.012)</td>
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<td>'Recurrent' Fast start&lt;sub&gt;j,t&lt;/sub&gt; [3]</td>
<td>0.053* (0.030)</td>
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<td>'Recurrent' Fast start&lt;sub&gt;j,t&lt;/sub&gt; [4]</td>
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<td>0.042*** (0.012)</td>
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- **Controls**: Yes, Yes, Yes, Yes
- **Project Fixed Effects**: Yes, Yes, Yes, Yes
- **Month Fixed Effects**: Yes, Yes, Yes, Yes
- **Year Fixed Effects**: Yes, Yes, Yes, Yes
- **Day of week Fixed Effects**: Yes, Yes, Yes, Yes
- **Funding cycle day Fixed Effects**: Yes, Yes, Yes, Yes

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<td># projects</td>
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<td>23,011</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.518</td>
<td>0.523</td>
</tr>
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</table>

Similar insight applies from the baseline fixed - effects estimations.
### Individual Learning

<table>
<thead>
<tr>
<th></th>
<th>Success&lt;sub&gt;i&lt;/sub&gt; (Ulule)</th>
<th>Success ratio&lt;sub&gt;i&lt;/sub&gt; (Ulule)</th>
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<tr>
<td></td>
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<td>(2)</td>
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<tr>
<td>Recurrent backer&lt;sub&gt;i&lt;/sub&gt;</td>
<td>0.028*** (0.002)</td>
<td>0.029*** (0.002)</td>
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<tr>
<td>Recurrent backer&lt;sub&gt;i&lt;/sub&gt;</td>
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<td>0.003*** (0.001)</td>
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<tr>
<td>Recurrent backer&lt;sub&gt;i&lt;/sub&gt;</td>
<td>0.007*** (0.001)</td>
<td>0.009*** (0.001)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.000*** (0.000)</td>
<td>-0.000*** (0.000)</td>
</tr>
<tr>
<td>€-value first contribution</td>
<td>0.017*** (0.000)</td>
<td>0.017*** (0.000)</td>
</tr>
<tr>
<td>Campaign duration</td>
<td>-0.053*** (0.001)</td>
<td>-0.053*** (0.001)</td>
</tr>
<tr>
<td>Cash contribution</td>
<td>0.063*** (0.001)</td>
<td>0.062*** (0.001)</td>
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<td>Country of residence</td>
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<tr>
<td>Category Fixed Effects</td>
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<td>Yes</td>
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<tr>
<td>Day Fixed Effects</td>
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<td>Yes</td>
</tr>
<tr>
<td># observations</td>
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<td>1,303,197</td>
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<tr>
<td>R²</td>
<td>0.080</td>
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### Social Learning

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<th>Timing&lt;sub&gt;i&lt;/sub&gt; (KKBB)</th>
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<tr>
<td>Recurrent backer&lt;sub&gt;i&lt;/sub&gt;</td>
<td>0.180*** (0.002)</td>
<td>0.179*** (0.002)</td>
<td>0.116*** (0.017)</td>
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<td>-0.001*** (0.000)</td>
<td>-0.000*** (0.000)</td>
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<td>0.008*** (0.000)</td>
<td>0.006*** (0.000)</td>
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<td>0.017*** (0.001)</td>
<td>0.014*** (0.001)</td>
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<tr>
<td>Cash contribution</td>
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<td>0.030*** (0.001)</td>
<td>0.030*** (0.001)</td>
<td>0.032*** (0.001)</td>
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</table>

**Country of residence Fixed Effects**
- Yes
- Yes
- Yes
- Yes
- Yes

**Category Fixed Effects**
- Yes
- Yes
- Yes
- Yes
- Yes

**Day Fixed Effects**
- Yes
- Yes
- Yes
- Yes
- Yes

**# observations**
- 1,302,899
- 1,302,899
- 1,302,899
- 1,302,899
- 638,673

**R<sup>2</sup>**
- 0.098
- 0.081
- 0.081
- 0.098
- 0.083
Platform growth

Evolution of number of backers (per month) on Ulule

Growth rate of recurrent contributions
- Ulule: 33.5%
- KKBB: 6.5%
Ulule – KKBB gap over time

Higher share of recurrent backers on Ulule than KKBB (its main competitor)
Takeaways

Evidence of various forms of network effects and learning on CFPs
• Positive within-project funding dynamics (documented by prior work)
• Positive cross-project funding dynamics (novel result)

Evidence of the role of recurrent backers
• They are better at spotting successful projects ⇒ individual learning
• They back projects irrespective of the behaviors of others ⇒ social learning

Significant implications for CFP
• Management
• Competition
Thank You
Backup slides
Crowdfunding

Traditional Funding

Large amounts from one, or a few, sources

Crowdfunding

Many small sums from a large group of individuals
A taxonomy of crowdfunding

Business models

Crowdfunding
- Donation-based
- Reward-based (pre-purchases)

Crowdlending
- Lending-based

Crowdinvesting
- Equity-based
- Royalty-based

The crowd

Backers

Lenders

Investors

Examples
Platforms and network effects

Platforms: Definition

• Entities that bring together economic agents, actively manages network effects among them and, thereby, generates economic value

Network Effects: 2 main categories

• One agent’s decisions as to whether and how much to interact on the platform affect the well-being of other agents …

• …in her own group ⇒ direct network effects
  • Economic agents derive a utility not only (and sometimes not even primarily) from a product or service, but from the interaction with other agents
  • Utilities are interdependent: agents are part of a ‘network’

• …in another group ⇒ indirect network effects
  • In many economic environments, agents can be sorted according to their role in, or their benefit from, a transaction
  • Agents belong to distinct groups
  • Network effects arise across members of different groups
Direct and indirect network effects

Entrepreneurs

CFP

Backers

(+) Higher chances to have project funded
(+) Improved efficiency
(+) Collective attention
(+) Wider set of projects to choose from
(+) Better fit of rewards
(-) Lower chances that any given campaign will be successful

(-) More competition
(+) Exchange of good practices
(+) Better services from the platform or from third-parties

(+) Higher chances to get compensated
(+) Word-of-mouth
(-) More competition for rewards or equity
## Panel fixed-effects estimations

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<td># new contributions&lt;sub&gt;i,t-1&lt;/sub&gt; [1]</td>
<td>0.172***</td>
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<td>0.171***</td>
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<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
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<tr>
<td># recurrent contributions&lt;sub&gt;i,t-1&lt;/sub&gt; [2]</td>
<td>0.128***</td>
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<td>0.127***</td>
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<td>(0.002)</td>
<td>(0.002)</td>
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<tr>
<td># new contributions&lt;sub&gt;-i,t-1&lt;/sub&gt; [1]</td>
<td></td>
<td>0.023***</td>
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<td>0.011***</td>
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<td>(0.002)</td>
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<td>(0.002)</td>
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<td>0.006***</td>
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<td>0.001</td>
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<td></td>
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<td>(0.001)</td>
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<td>(0.001)</td>
</tr>
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<td></td>
<td>0.066***</td>
<td>0.042***</td>
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<td>(0.003)</td>
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<td></td>
<td>0.012***</td>
<td>0.006**</td>
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### Control variables
- Yes: Control variables included
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- Yes: Control variables included
- Yes: Control variables included

### Project Fixed Effects
- Yes: Project fixed effects included
- Yes: Project fixed effects included
- Yes: Project fixed effects included
- Yes: Project fixed effects included

### Month Fixed Effects
- Yes: Month fixed effects included
- Yes: Month fixed effects included
- Yes: Month fixed effects included
- Yes: Month fixed effects included

### Year Fixed Effects
- Yes: Year fixed effects included
- Yes: Year fixed effects included
- Yes: Year fixed effects included
- Yes: Year fixed effects included

### Day of week Fixed Effects
- Yes: Day of week fixed effects included
- Yes: Day of week fixed effects included
- Yes: Day of week fixed effects included
- Yes: Day of week fixed effects included

### Funding cycle day Fixed Effects
- Yes: Funding cycle day fixed effects included
- Yes: Funding cycle day fixed effects included
- Yes: Funding cycle day fixed effects included
- Yes: Funding cycle day fixed effects included

### Observations
- 814,960
- 814,960
- 814,960
- 814,960

### Projects
- 23,022
- 23,022
- 23,022
- 23,022

### R²
- 0.550
- 0.529
- 0.529
- 0.551
Monthly evolution of number of new (in red) and recurrent (in blue) backers