

Successfully Obtaining Public R&D Grants: The Importance of Project and Firm Characteristics

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Introduction

- Government authorities finance R&D projects in the business sector for billions of USD
- Firms apply for R&D grants (often 50 – 50 % financing)
- Review committee evaluate applications

Purpose

- Purpose: Empirically test which firm and project characteristics determine acceptance / rejection
- Database on 4 000 R&D grant applications from Austria 2004-15.
 - Firm characteristics
 - Project characteristics
 - Previous experience and success of the financier
- Probit model with mixed effects

Theories and previous studies

- Picking the winner (Stiglitz and Wallsten 2000)
 - Fund managers select projects with high probability of success rather than risky projects with high return but lower probability of success.
- Previous empirical literature: Firm characteristics important for grants
 - Large firms
 - High R&D-intensity
 - Novelty R&D-projects
 - Previous successful applications

(Aschoff 2010, Cantner & Köstner 2012, Duguet 2004, Feldman & Kelly 2006, etc.)

Database

- Austrian R&D funding agency (FFF)
 - Largest provider of R&D grants in Austria (300 MEUR annually)
- 3800 R&D applications in the database
- 1300 different applying firms
- Firm level data (3 years prior application)
 - Sales, employment, exports, cash flow
 - R&D activities - employees and expenditures
- Project level data
 - Approval or rejection
 - Duration, costs, share of funding
 - Fund's expert rating of R&D proposal (see next page)

Fund's rating of 30 evaluation criteria

- Each variable rated on an ordinal 5-level scale (1 to 5). Measured as dummies: if 5 or 4 then = 1, if 3, 2 or 1 then =0)
- Expected effects of project
 - Additionality and know-how gains
 - Overall economic and social effects
- Quality of the R&D project
 - Novelty / technological innovation
 - Complexity of development
 - Environmental effects
- Degree of commercialization
 - Market experience and prospects
- Suitability of project team
- Financial suitability

Dependent variable and method

- One project = one observation
- Binary dependent variable
(approval = 1 / rejection = 0) → Probit model
Approval percentage = 80 %.
- $\Pr(Y=1) = \Pr(Y= 1|X) = \Phi(X'\beta)$
Latent variable $Y^* = X' \beta + \epsilon$
 $Y = 1$ if $Y^* > 0$ and 0 if $Y^* \leq 0$
- X represent firm and project characteristics
- Random effects probit model (error terms allowed to vary across firms)

Expected impacts on approval

- Picking the winner-theory
 - Firm's with high cash flow should be preferred
- Difference between large and small firms?
- Project level criteria
 - Expect these to be the most important:
Innovative content
Complexity of the project

Table 1. Distribution of rating scores

Evaluation criteria	1	2	3	4	5
Expected additionality (project)	2.0	1,7	21.3	59.9	15.1
Expected additionality (firm)	0.3	0.7	22.2	69.8	7.0
Innovative content	0.8	2.0	30.2	61.1	6.0
Gains in know-how	0.2	1.8	45.7	50.0	2.3
Complexity of development	0.8	3.5	34.6	56.7	4.4
Technical feasibility	0.6	0.8	9.7	69.9	19.0
Market prospect	0.5	2.0	29.0	68.0	0.5
Utilization possibilities	0.4	1.0	11.5	61.5	25.6
Management and organization	0.8	1.0	10.6	79.4	8.2
Financial performance	0.8	1.8	16.3	53.6	27.5
Social aspects	0.2	0.3	83.8	13.5	2.2
Environmental aspects	0.2	0.4	71.7	25.5	2.2

Characteristics of rejected and approved projects (median)

Evaluation criteria	Rejected projects	Accepted projects
Budget of project	104 100 €	465 300 €
Firm employment	55	119
R&D-intensity	0.079	0.075
Cash-flow ratio	0.075	0.085

Table 2. Acceptance rate

Evaluation criteria	1-3	4-5
Expected additionality (project)	0.63	0.87
Expected additionality (firm)	0.61	0.87
Innovative content	0.57	0.93
Gains in know-how	0.70	0.91
Complexity of development	0.62	0.93
Technical feasibility	0.56	0.85
Market prospect	0.66	0.88
Utilization possibilities	0.64	0.87
Management and organization	0.44	0.86
Financial performance	0.73	0.83
Social aspects	0.79	0.87
Environmental aspects	0.80	0.83

Table 3. Probit model

Evaluation criteria	ME probit	Standard probit
Expected additionality (project)	0.116 ***	0.147 ***
Expected additionality (firm)	0.047 ***	0.052 ***
Innovative content	0.170 ***	0.219 ***
Gains in know-how	0.036 ***	0.038 ***
Complexity of development	0.158 ***	0.194 ***
Technical feasibility	0.115 ***	0.143 ***
Market prospect	0.054 ***	0.063 ***
Utilization possibilities	0.095 ***	0.109 ***
Management and organization	0.121 ***	0.179 ***
Social aspects	-0.008	-0.005
R&D intensity (t-1)	-0.013	-0.005
Cash-flow to sales (t-1)	0.013	-0.009
Log employment (t-1)	-0.018 *	-0.017 *
Project budget	-0.012 ***	0.003

Conclusions

- Neither firm level characteristics nor industry affiliation have any impact on approval
- Most evaluation criteria have a significant impact on approval
 - Most important:
 - Innovative content (m.e. = 17 percentage points)
 - Complexity of development (m.e. = 16 percentage points)
 - Less important:
 - Social aspects
- R&D managers in firms should focus on radical new innovative ideas rather than minor improvements when applying for grants.

To be done:

- Applicant experts
- Impact of firm's
 - previous experience of applying for grants from FFF.
 - previous success when applying for grants from FFF