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EVALUATION FWF – IMPACT ANALYSIS

BACKGROUND REPORT 4.2

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Evaluation FWF

Impact Analysis

Background report 4.2.

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1 Introduction

The present study is part of the evaluation of the Austrian Science Fund (FWF) and provides the impact analysis of the research funding by the FWF. Measuring the impact of a Fund which promotes mainly basic science is not an easy task. This is mainly due to two interrelated characteristics, the broad spectrum and heterogeneous outcomes of basic research. The mission statement of the FWF indicates this difficulty:

We invest in new ideas that contribute to an advance in knowledge and thereby to further developments. We are equally committed to all branches of science and the humanities and are guided in our operations solely by the standards of the international scientific community¹.

Specific responsibilities and aims specify this overall objective, in the sense that the FWF contributes to an advance in knowledge and developments. The aims of the FWF are:

- A continued improvement of science in Austria and an increasing of its international competitiveness.
- An enhancement of the qualifications of young scientists.
- A strengthening of the awareness that science represents a significant aspect of our culture.

Of course, the primary results of research activities are the advancement of knowledge, and these results are usually referred to as the *output* of the research activity. This output may take the form of publications, articles in scientific journals, books, conferences papers, posters, etc. Directly complementary to such scientific productions are the so-called ‘second rank outputs’ such as patents and related items that concern (potential) applications of research results.

However, beyond such quantifiable outputs, there are kinds of outcomes which are not immediately measurable or quantifiable, respectively. These may include for example the enhancement of qualification of young scientists; the increased expertise and capacity of researchers and research units for consulting; contract research activities. Other types may include international links developed by the research community under consideration and, last but not least, the contribution of research to culture in general. It appears that including all levels, from individuals and institutions to the entire system would go beyond the practicability of such an evaluation.

In our study we thus concentrate primarily on the first type of output and only partly on the second – the promotion of high-quality scientific research as well as scientific outputs related to potential commercial applications. This is mainly due to methodological reasons because measuring the impact of the FWF activities for the public awareness and understanding of science needs different methodologies and approaches and is therefore excluded from the evaluation. To assess the enhancement of qualification (via the training and mobility programmes for researchers for example) is difficult as well: no monitoring process follows the career path of a researcher and it would thus have been rather difficult to capture the main effects of the FWF mobility programme via a questionnaire – apart from the difficulty to find the actual (email) addresses of the researchers.

The structure of the report

The study is divided into different sections led by different hypotheses and based on different databases. Within these the first two sections go to the heart of an evaluation of a research funding organisation like

the FWF: they aim at identifying parameters which influence the Fund's decision on whether to accept or reject a certain proposal.

The first section looks at application numbers and rejection rates from a variety of perspectives: the proposal's field of science, the solicited funds, the co-ordinator's home institution and the interdisciplinarity. This kind of analysis is rather descriptive and is based on project-level data provided by the FWF.

To complement these "one-dimensional" approaches, a multi-variate model of binary choice will be estimated in the second section. As we will see, the overall prediction power of this model is modest, although some included variables do exhibit significant correlation with the outcome of the decision process.

The third section examines the relevance of FWF funding for the university system. It is a well-known fact that in Austria the external funding of Higher Education Expenditures on R&D (HERD) is small compared with other (small) countries. FWF funds are small compared to General University Funds (GUF) and industrial funding is even smaller. However, the use of output-related data of university institutes puts us into the position to estimate the effect of FWF funding on a major aspect of scientific outputs, i.e. publications.

The next sections are based on a survey which was conducted at the beginning of the evaluation exercise: the survey produced very useful information and made it possible to capture the view of the approved (and rejected) submitters of research proposals concerning different issues. The fourth section thus tries to elaborate on the differences between funded and rejected research proposals in relation to their assessment of the proposal, the self-positioning of the research unit, the final aims of the proposed research project and – in the case of the rejected proposal – their assessment of the possible reasons for the rejection. The question of what happens with rejected proposals completes this section.

The fifth section is output-related and covers the analysis of the main (scientific and – for some cases – commercial) outputs of the funded projects, the impact on the researchers as well as societal effects.

A summary of the main findings finalises this report.

¹ <http://www.fwf.ac.at/en/portrait/portrait.html>

2 FWF-funded Projects - Determinants of Participation²

2.1. THE DATA

The project-level data were provided by FWF; they comprise the period from 1998 (from the inception of the data base) to mid-2003. The data base consists of two parts, one containing information on the project co-ordinator, the other on project data.

The data base lists 3997 individual project coordinators, who submitted a total of 6723 proposals. The proposals belong to a total of 18 programmes at the FWF (for a list plus their 1998-2003 share in the FWF's budget, see Table 1).

Table 1: FWF programmes³

code	name of programme		share in total FWF budget, 1998-2003
A	Anbahnung intern. Kooperationen	<i>initiation of intern. co-operations</i>	0.2
B	Konzeptphase	<i>concept phase</i>	-
C	Vorbegutachtung Wissenschaftskolleg	<i>feasibility study for Science College</i>	-
D	wiss.Veröffentlichungen	<i>scientific publications</i>	0.8
E	Impulsprojekt	<i>Impulse project</i>	0.8
F	SFB Spezialforschungsbereich	<i>special research programmes</i>	15.5
G	Kosten im Vorfeld eines SFB	<i>costs to set up a special research programme</i>	-
H	Charlotte Bühler Stipendium	<i>Charlotte Bühler grant</i>	0.7
I	Konzeptphase EUROCORES	<i>concept phase EUROCORES</i>	0.2
J	Schrödinger Stipendium	<i>Schrödinger grant</i>	3.6
M	Lise Meitner Stipendium	<i>Lise Meitner grant</i>	1.2
P	Einzelprojekt	<i>scientific project</i>	63.6
R	Erwin Schrödinger-Rückkehrprogramm	<i>Erwin Schrödinger return programme</i>	0.5
S	FSP Forschungsschwerpunkt	<i>joint research programmes</i>	3.7
T	Hertha Firnberg	<i>Hertha Firnberg grant</i>	1.7
U	Euryi	<i>Euryi Award</i>	0.2
W	Wissenschaftskolleg	<i>Science College</i>	1.1
Y	START_Programm	<i>START programme</i>	3.8
Z	Wittgenstein	<i>Wittgenstein grant</i>	2.3

Source: own calculations on the basis of FWF data

Out of the total amount granted by the FWF, which in 2002 amounted to 91.53 Mio € (up from 85.9Mio € in 2001), by far the most important line of programme, with almost 70 % of the FWF's budget, is of type P, *scientific projects*, followed by type F, *special research programmes*. The individual grants (types H, J, M, T, and Z) account for about 9 % of the total amount, the high-powered grants for outstanding young scientists (types Y and Z) for a further 10 %.

² The authors would like to express his deep gratitude towards the FWF's Rudi Novak and Gerald Wurz for their co-operation and their - virtually limitless - support.

³ The shares presented in the table are calculated on the basis of the total amount of grants incorporated in the data base. However, four of the 18 programmes are not part of the FWF budget proper, but rather are financed directly by two ministries, with the FWF serving only as administrator. These programmes are the *Impulsprojekte* (financed by BMVIT) on the one hand and *START*, *Wittgenstein* and *Herta Firnberg* on the other (financed by BMBWK), together accounting for 8.6 % of all resources administered by the FWF.

In the following (as well as in the survey), we restricted the analysis to programmes of type F, P, and S (thus concentrating on “project-based” programmes), which received about 83 % (or almost 90 % of the regular FWF budget; cf. footnote 3) of the money granted by the FWF during the years 1998-2003⁴.

As for the distinction in “accepted” and “rejected” proposals, the decision process at the FWF leads to one of six possible outcomes:

Table 2: Possible outcomes of the FWF’s decision process

Code	Decision		share [%]	
			all programmes	programmes P, F, S
A	abgelehnt	<i>rejected</i>	39.1	43.0
W	bewilligt	<i>accepted</i>	49.3	49.6
B	bedingt bewilligt	<i>conditionally accepted</i>	2.9	1.6
Z	zurückgestellt	<i>decision deferred</i>	0.0	0.0
C	abgesetzt	<i>rejected on technical grounds</i>	7.6	5.0
D	zurückgezogen	<i>proposal retracted</i>	1.0	0.7

Source: own calculations on the basis of FWF data

With almost 90 % (93 % in the case of programmes P, F, and S), the vast majority of decisions is a clear-cut A or W, *rejected* or *accepted*. In the analysis, outcomes W and B were taken to denote “accepted proposals”; A, Z, C, and D were lumped together to form the group of “rejected proposals”.

2.2. DESCRIPTIVE ANALYSIS

A straightforward perspective on the question of applications numbers and rejection rates is from a fields of science⁵ point-of-view: do different fields of science find a “level” playing field, or are projects of some fields accepted more easily than others? The following Table 3 presents a summary statistics of applications and grants by main fields of science.

Table 3: Applications and grants by main field of science, 1998-2003⁶

main scientific field	# proposals	shares [%] in:		
		# accepted proposals	solicited amount	granted amount
no classification	0.1	0.1	0.4	0.8
Natural Sciences	45.5	51.2	49.5	54.6
Technical Sciences	5.8	5.1	5.2	4.8
Human Medicine	22.1	17.8	24.3	19.2
Agriculture and Forestry, Veterinary Medicine	1.5	1.0	1.4	1.0
Social Sciences	7.5	5.0	5.8	3.8
The Humanities	17.6	19.8	13.4	15.8

Source: own calculations on the basis of FWF data

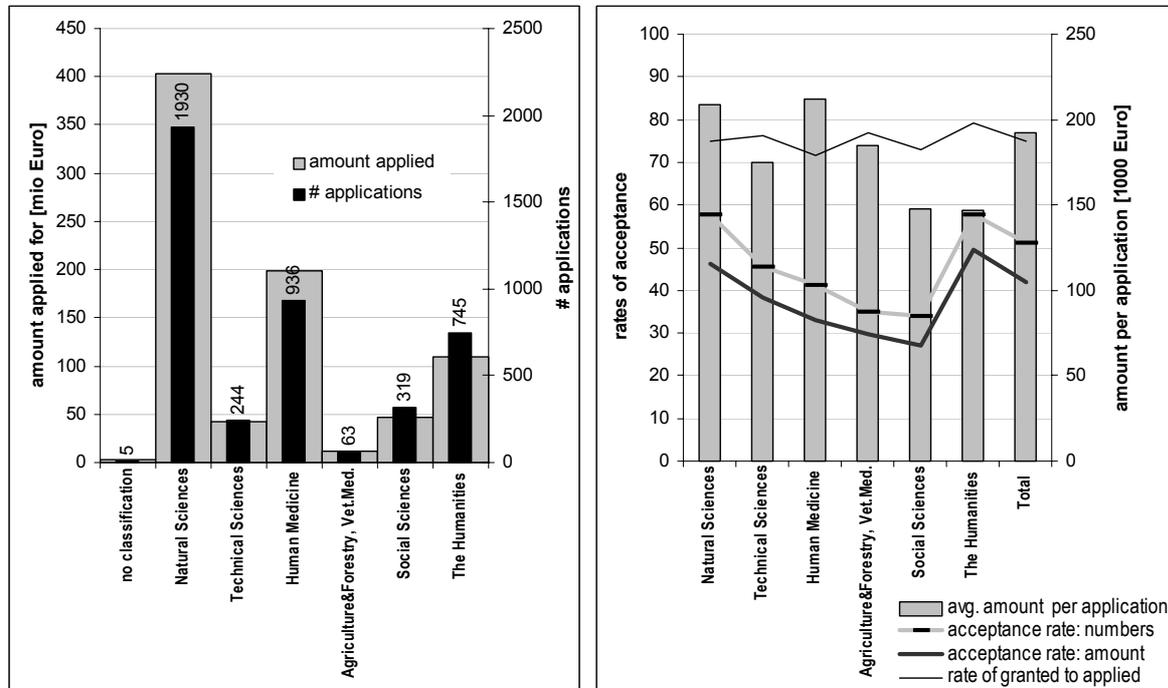
⁴ The analysis described in the following sections, however, does include only those projects in programme types F and S which were newly submitted in 1998 or later, i.e. projects started before 1998 were not included even if they received follow-up funding in the period 1998-2003. As the duration of projects of type F and S is some 7-10 years, this is not inconsequential, but was necessary due to technicalities pertaining to the data base.

⁵ Along with the FWF, we use the classification of EUROSTAT, which distinguishes between 6 broad 1-digit fields of science: Natural Sciences; Technical Sciences; Human Medicine; Agriculture and Forestry, Veterinary Medicine; Social Sciences; the Humanities. Below this 1-digit level, a total of 54 fields are differentiated on the 2-digit level, a number which on the finest, 4 digit-level rises to 1431 fields. The FWF data contain the 4-digit codes for the main field of science plus up to 3 other fields of science. For the present purpose, we used only the 2- and 1-digit equivalents.

⁶ The data base provided by the FWF contains applications filed in the period 1998:01 to 2003:07

Since 1998, 4242 applications were filed at the FWF, asking for a total of 816 Mio Euros. Almost half of all applications belong to the *Natural Sciences* (45 % of projects which account for almost 50 % of the solicited financial means and 55 % of the total amount granted by the FWF), followed by *Human Medicine* (22 %) and *the Humanities* (18 %). *Social, Technical, and Agricultural Sciences* account for 7.5, 5.8 and 1.5 % of all applications, respectively.

Figure 1: Applications and Participations: FWF-funded Projects, 1998-2003



Source: own calculations on the basis of FWF data

On average, the “biggest” projects can be found in *Human Medicine* and the *Natural Sciences*, asking for around 210,000 € per application. On the other end, the *Social Sciences* and *the Humanities* apply for about 150,000 € per project.

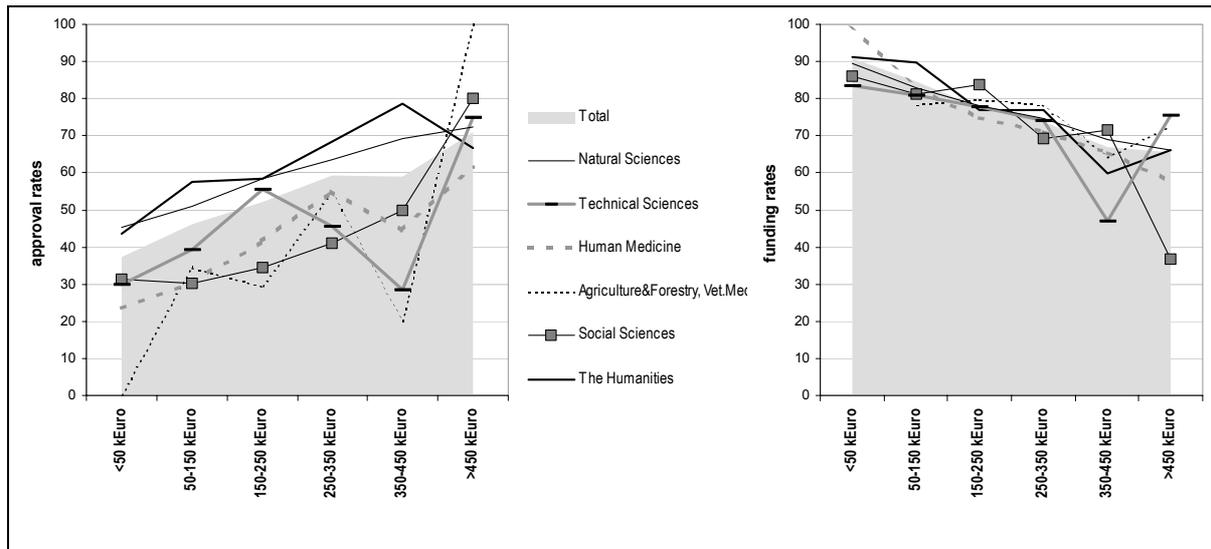
Acceptance rates are highest in the *Natural Sciences* and *the Humanities* with close to 58 %. Most rejections take place in the *Agricultural* and *Social Sciences*: only about one third of their applications receive funding (35 and 34 %, resp.), which is well below the average approval rate of 51 %⁷.

Moneywise, the approval rates are lower than for the number of applications. The reasons are twofold: first, the typical approved project does not receive the full amount it has asked for; rather, it gets funded for only three fourths of the solicited amount. This “funding rate” is quite homogeneous, ranging from a low of 70 % in the case of *Human Medicine* to a high of 80 % for *the Humanities*.

The other is that proposals of different size face different chances of being accepted, even within the same field of science (Figure 2):

⁷ According to oral communication with the FWF, the main reason for this high rejection rate is the fact that in the social and medical sciences the “gray zone” between “scientific” and what might be called “descriptive” projects is especially large; the FWF, however, only funds scientific projects.

Figure 2: Approval & Funding Rates for FWF Proposals, 1998-2003



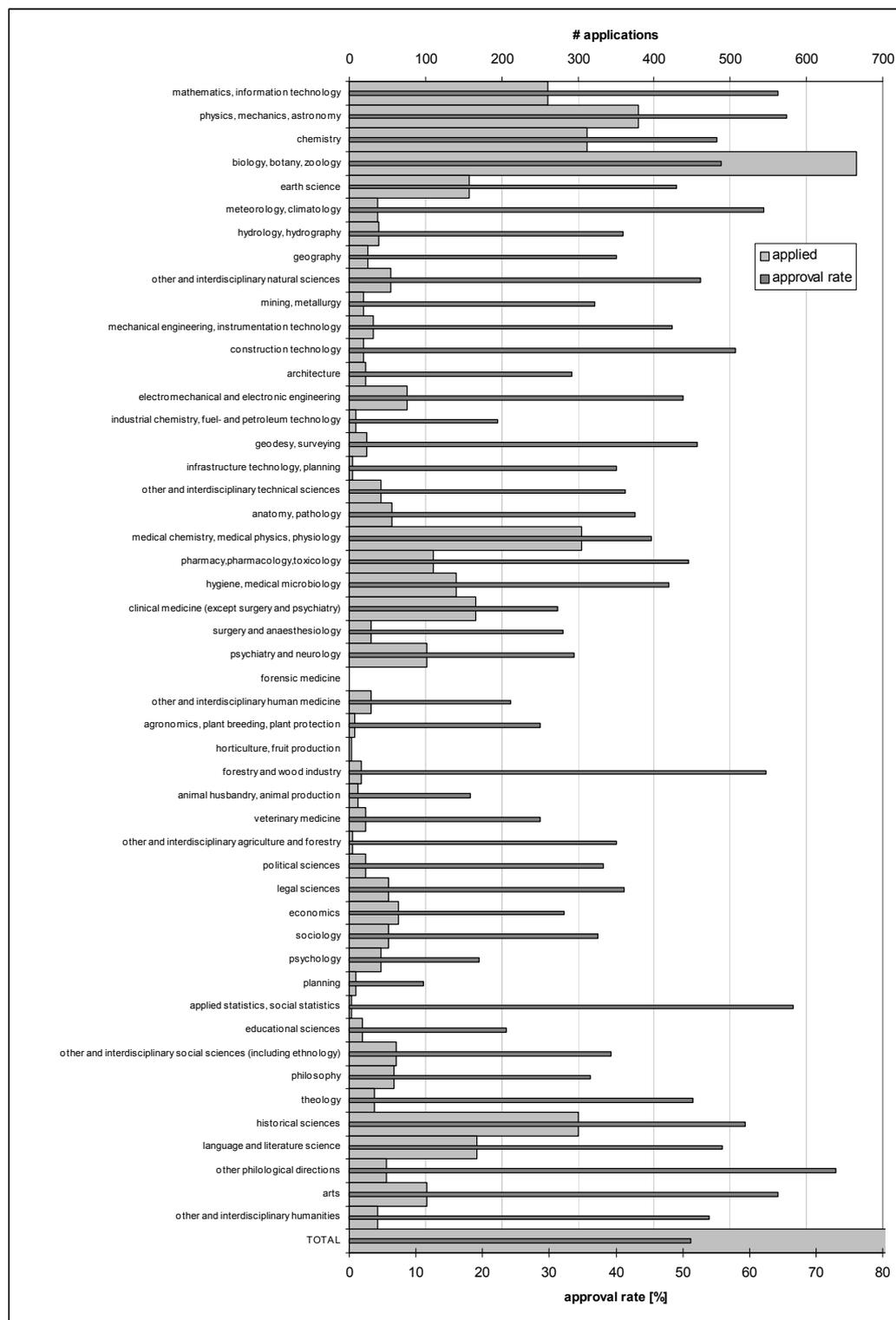
Source: own calculations on the basis of FWF data

The higher the solicited amount, the higher the chance of the project being approved (left diagram). If, on the other hand, a project gets approved, it typically gets a higher funding rate the lower the solicited amount: whereas applications for less than 50 000 €, if approved, receive almost 90 % of the amount that had been asked for, the most expensive projects are typically reduced by about a third. This pattern is very much the same for projects in all 6 broad fields of science.

The following Figure 3 shows the numbers of application and approval rates on a 2-digit level (49 narrower fields of science). Application numbers vary widely: some fields have filed not a single application (not as the “main field”, that is: all of the fields listed in the diagram have been named “main” or “other” field of science in at least one submitted project); *Biology/Zoology/Botany*, on the other hand, boasts some 665 projects listing it as their main (or only) field of science.

As can also be seen from the diagram, approval rates are quite heterogeneous. Unsurprisingly, approval rates show higher volatility the smaller the number of applications; the higher this number, the more approval rates are clustered around a level which is typical for the respective 1-digit category.

Figure 3: Applications & approval rates for 2-digit fields of science, 1998-2003 (present)



Source: own calculations on the basis of FWF data

The following Table 4 shows, on the institutional level, a similar pattern: the smaller the number of applications, the higher the volatility of approval rates.

Table 4: Application numbers and approval rates by institutions, 1998-2003 (present)

	# proposals	approval rate [%]
Montanuniversität Leoben	62	44
Paris-Lodron-Universität Salzburg	240	53
Technische Universität Graz	177	48
Technische Universität Wien	430	58
Universität für Bodenkultur Wien	188	48
Universität Graz	385	49
Universität Innsbruck	552	50
Universität Klagenfurt	25	56
Universität Linz	124	62
Universität Wien	1261	53
Veterinärmedizinische Universität Wien	71	37
Wirtschaftsuniversität Wien	52	40
other Universities (colleges of art & music)	21	52
Sum: Austrian Universities	3581	52
Austrian Academy of Science	176	57
R&D institutions under company law	43	63
public institutions	130	52
other institutions	229	38
no current institutional affiliation	83	43
Total	4242	51

Source: own calculations on the basis of FWF data

In total, of the 4242 applications which were submitted to the FWF since 1998, about 51 % were approved. Among the Austrian Universities (which, by the way, account for about 84 % of all applications), the University of Linz, at 62 %, exhibits the highest approval rate; the lowest rate of 37 % can be observed for the University of Veterinary Medicine.

R&D organisations under company law⁸ (63 %) and the Austrian Academy of Science (Akademie der Wissenschaften, OeAW), at 57 %, experienced above-average approval rates.

Public institutions⁹, at 52 %, face the same approval rates as the average Austrian University. All other institutions which are mentioned in the FWF data base are subsumed in the group of “other institutions”¹⁰, with a below-average rate of approval of 38 %.

2.2.1 Inter-disciplinarity of FWF projects

A different aspect of projects concerns inter-disciplinarity. When applying for FWF funding, project coordinators have to classify the scientific content of their proposal according to the international science classification system. This system distinguishes between 6 broad fields of science (Natural Sciences; Technical Sciences; Human Medicine; Agriculture and Forestry, Veterinary Medicine; Social Sciences; the Humanities.) Below this 1-digit level, a total of 54 fields are differentiated on the 2-digit level. The finest level, at 4 digits, comprises 1431 fields.

Every project proposal has to specify at least one field of science (on the 4-digit level), and can name up to 3 additional fields. Assigned to each field is a value for its scientific share in the project: take, for ex-

⁸ These include (independently registered) research departments of private or public companies, institutes of the Austrian Research Centers, or the International Institute of Applied Systems Analysis in Laxenburg

⁹ for example, public research institutes, publicly owned hospitals and museums, etc.

¹⁰ These include private R&D institutes, but also, for example, (non-publicly-owned) hospitals and museums.

ample, a project with main field 1406 (share of this field: 80 %) and additional field 1423 (with a share of 20 %). This defines a project whose scientific content mainly belongs to *Zoology* (1406), but which also includes some elements of *Experimental Zoology* (1423).

This puts us in the position to assess the “inter-disciplinarity” of the projects. To keep the diagrams tractable, we used not the 4-digit fields, but their 2-digit “umbrella”. The following Figure 4 lists the 49 2-digit fields which, since 1998, were mentioned as at least one project’s “main field of science”. The first column contains the “main fields of science”. Across, in the first row the possible “other fields of science” are listed.

For main field i , the column labelled “main field” contains i ’s average scientific share in those projects which list i as its main field, but which list other fields as well. The column “single field” shows the share of projects which mention i as the only field of science. Element ij , then, contains the average scientific share of field j in projects which name i as their main field of science. All averages are weighted averages, with the amount of the grant used for weights; the diagram, therefore, shows the inter-disciplinarity of approved projects, not of project applications.

On average, 13 % of the total project sum are spent in „single-field“ projects, which have no interdisciplinary aspect whatsoever. A further 51 % of the scientific content are assigned to the “main field”. Of the “additional fields”, the most important ones are *Biology/Botany/Zoology* which is of special importance in projects which belong to the 1-digit groups of *Human Medicine* and *Agriculture/Forestry/Veterinary Science*; about 8 % of the scientific content can be attributed to this field. The second most important field, at about 5 %, is *Physics/Mechanics/Astronomy*, followed by *Mathematics/Information Technology*; *Chemistry*; and *Medical Physics/Med.Chemistry/Physiology*, each representing about 3 % of the scientific content. Not surprisingly, the most important “additional” 1-digit group is *Natural Sciences* (11-19), followed by *Human Medicine* (31-39). The other 4 1-digit groups are of minor importance.

On the 2-digit level, inter-diciplinarity seems to take place predominantly among fields of the same 1-digit group; additional fields from other 1-digit groups are comparatively rare (the not very surprising exception being the *Natural Sciences*, which exhibit some importance especially for projects in *Human Medicine*, the *Technical Sciences*, and *Agriculture/Forestry/VetMedicine*. The most self-contained are *the Humanities*, which hardly ever borrow from other 1-digit fields.

2.3. A MODEL OF BINARY CHOICE

As seen above, a multitude of ways to look at the data can be devised: from a field-of-science point of view (1-,digit, 2-digit, even 4-digit might be employed – although not very productively), the proposed project’s size, the project coordinator’s home institution, etc.

Therefore, a model was devised which aims at simultaneously solving for all these dimensions. The dependant variable of this model, its left hand side, was the outcome of the FWF’s decision process: rejection or approval. On the right hand side, the independent variables comprise essentially all the information which is collected in the FWF’s database. Almost all of the variables are included as dummies¹¹ (for quite a few, this was a natural choice, as in the case of “male/female co-ordinator” or “co-ordinator is/is not professor”. For others, this choice was not so obvious, as for example the decision to include project size in the form of a categorical variable rather than straightforwardly in its continuous €-denomination. The reason for this was that the utilization of size classes allowed for a highly non-linear response of the probability of approval to project size. By this design, it was possible for, e.g., small projects to exhibit higher probabilities than mid-sized and larger projects, with very large-sized projects again facing better chances. In a continuous setting, this would have to be modelled by including project size, along with the linear representation, in its quadratic and/or cubic form (plus maybe even higher-order terms), implying a degree of mathematical sophistication which simply is not adequate for the description of the underlying process.

As already mentioned, the dependant variable was a binary variable: 0 for rejected, 1 for approved projects. Accordingly, the model was estimated as a probit model (which among other desirable features restricts simulated values of the dependent variable to fall within the [0,1]-range). The

¹¹ We refrained from using “interactive” dummies (e.g., the inclusion of the regressor sex * foreign would constitute such an interactive dummy: it would allow for female coordinators with a foreign address to face other probabilities than a female coordinator with a domestic address. The two dummies sex and foreign in parallel, on the other hand, distinguishes only between female and male on the one hand and foreign or domestic on the other). The inclusion of only a small number of possible “interactive” dummies would rapidly have lead to an explosion of our model. Besides, the descriptive statistics of the regressor variables with respect to the question of approval did not really hint at the necessity for such interactive dummies.

following Table 5 lists, along with some summary statistics, the variables of this binary choice model.

Table 5: Variables of the FWF decision model plus summary statistics

Variable	Description	Mean	Median	Maximum	Minimum	Std. Dev.
GRANTED	0 if project rejected, 1 if approved	0.504	1	1	0	0.500
Age30M	1 if project coordinator younger than 30	0.016	0	1	0	0.125
Age30_40	1 if project coordinator between 30 and 40 years old	0.288	0	1	0	0.451
Age50_60	1 if project coordinator between 50 and 60 years old	0.284	0	1	0	0.451
Age60_70	1 if project coordinator between 60 and 70 years old	0.079	0	1	0	0.270
Age70P	1 if project coordinator older than 70	0.012	0	1	0	0.109
NumberProjects	total number of coordinator's applications, 1997-2003	2.567	2	11	1	1.734
Prof	1 if coordinator is professor, 0 otherwise	0.682	1	1	0	0.466
sem2	1 if decision is made in 2nd half of the year, 0 otherwise	0.337	0	1	0	0.473
FoS2	main field of science: Technical Sciences	0.059	0	1	0	0.236
FoS3	main field of science: Human Medicine	0.224	0	1	0	0.417
FoS4	main field of science: Agriculture and Forestry, Veterinary Medicine	0.016	0	1	0	0.124
FoS5	main field of science: Social Sciences	0.073	0	1	0	0.261
FoS6	main field of science: The Humanities	0.176	0	1	0	0.381
Sex	1 if female coordinator, 0 if male coordinator	0.138	0	1	0	0.344
SingleFoS	1 if no "other field of science"	0.144	0	1	0	0.351
DiffFoS2	1 if other 2-digit field of science, 0 otherwise	0.893	1	3	0	0.981
DiffFoS1	1 if other 1-digit field of science, 0 otherwise	0.410	0	3	0	0.749
PercentFoS1	scientific share of "main field of science"	58.849	50	100	5	22.250
Sum50M	1 if project size < 50 k€	0.058	0	1	0	0.234
Sum50_150	1 if project size 50 - 150 k€	0.383	0	1	0	0.486
Sum250_350	1 if project size 250 - 350 k€	0.167	0	1	0	0.373
Sum350_450	1 if project size 350 - 450 k€	0.049	0	1	0	0.216
Sum450P	1 if project size > 450 k€	0.021	0	1	0	0.145
Foreign	1 if coordinator with foreign address, 0 otherwise	0.007	0	1	0	0.085
Private	1 if coordinator not affiliated with some institution	0.009	0	1	0	0.096
OeAW	1 if coordinator affiliated with the Academy of Science	0.042	0	1	0	0.200
UNI	1 if coordinator affiliated with a University	0.849	1	1	0	0.359
TU	1 if coordinator affiliated with a Technical University	0.205	0	1	0	0.403
incRD	1 if coordinator affiliated with an incorporated R&D organisation	0.010	0	1	0	0.101
publicRD	1 if coordinator affiliated with a public R&D organisation	0.031	0	1	0	0.173

Source: own calculations on the basis of FWF data

The estimated parameters of the model are shown in Table 6:

Table 6: Regression results for the Binary Choice model

Dependent Variable: GRANTED_01

Method: ML - Binary Probit (Quadratic hill climbing)

Included observations: 4014 after adjusting endpoints

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.0609	0.1374	0.443	0.66
Age30M	-0.4965	0.1821	-2.727	0.01
Age30_40	-0.0083	0.0549	-0.152	0.88
Age50_60	-0.1082	0.0540	-2.003	0.05
Age60_70	-0.1589	0.0829	-1.916	0.06
Age70P	-0.2505	0.1931	-1.297	0.19
NumberProjects	-0.0564	0.0124	-4.545	0.00
Prof	0.3214	0.0539	5.968	0.00
sem2	-0.0930	0.0429	-2.169	0.03
Technical Sciences	-0.2126	0.0943	-2.254	0.02
Human Medicine	-0.3848	0.0581	-6.627	0.00
Agriculture&Forestry, Vet.Med	-0.4642	0.1690	-2.747	0.01
Social Sciences	-0.4938	0.0863	-5.718	0.00
The Humanities	0.1138	0.0646	1.761	0.08
Sex	0.0579	0.0611	0.947	0.34
SingleFoS	-0.1580	0.0895	-1.765	0.08
DiffFoS2	-0.0773	0.0291	-2.658	0.01
DiffFoS1	-0.0364	0.0359	-1.014	0.31
PercentFoS1	0.0012	0.0014	0.862	0.39
Sum50M	-0.3896	0.0944	-4.129	0.00
Sum50_150	-0.1799	0.0493	-3.651	0.00
Sum250_350	0.1862	0.0614	3.031	0.00
Sum350_450	0.1046	0.0988	1.059	0.29
Sum450P	-0.0034	0.1415	-0.024	0.98
Foreign	0.2033	0.2500	0.813	0.42
Private	-0.1475	0.2370	-0.622	0.53
OeAW	0.4257	0.1310	3.249	0.00
UNI	0.1622	0.0924	1.756	0.08
TU	-0.0283	0.0594	-0.477	0.63
incRD	0.5559	0.2238	2.484	0.01
publicRD	0.3017	0.1441	2.093	0.04
McFadden R-squared	0.051			
Obs with Dep=0	1989		Total obs	4014
Obs with Dep=1	2025			

coefficient significant at 10% level
coefficient value significant at 5% level

Source: own calculations on the basis of FWF data

The Pseudo-R² of the estimation is quite low, implying low predictive power of the model: using the model improves the forecast only modestly beyond the statistical 51:49 chance¹² of guessing the right outcome (statistically, the percent gain in using the model, i.e., the percent of incorrect (default) predictions corrected by the equation, would be only about 7 %, raising the chances of a correct prediction from the naive 51 % to about 57 %). In the present context, this means that there seem to be no types of projects which are either “natural losers” or “natural winners”.

¹² We have a total of 4014 project applications, 2025 of which were approved and 1989 were rejected. Therefore, the “naive” predictor of a projects chances of being accepted are 2025/4014 ~ 50.5 %

Nevertheless, a majority of coefficients are significant at least at the 10 % level, implying that their respective variables are significantly correlated with the outcome of the decision process (i.e., rejection or approval of the proposal)^{13, 14}.

By the design of the model, the “benchmark project” was one submitted by a male coordinator in his 40s (because the dummy AGE40_50 is excluded from the list of regressors, the effect of belonging to this age group will be picked up by the regression’s constant term), who is not a professor, whose project was decided upon in the first half of the year, the project’s main field of science was “Natural Sciences”, the project sported another secondary field of science, which does not belong to either a different 2-digit or 1-digit field (as a consequence, it must be a different one on a 4-digit level). The solicited sum is in the range of 150 to 250 k€. The coordinator does not have a foreign address, is not a “private” contractor, and is not affiliated with either the Austria Academy of Science, a University (or Technical University), or an incorporated or public research organisation (consequently, the coordinator must come from either some “other” research organisation or his affiliation is missing from the data base). The parameter values of the included regressors, then, describe the difference in the probabilities of approval as estimated for the “benchmark project”: negative parameter values imply worse chances, positive values imply better chances of approval.

As it is, the parameter values – aside from their sign – are hard to interpret: a value of 0.32 for the “professor”-dummy does not imply that a professor faces chances which are 32 %points better than the chances of a non-professor. Such “percentages” have to be calculated by simulations. The following Table 7 gives the results of just such an exercise.

¹³ A cautionary remark: it would be wrong to interpret the coefficients causally. For example, it would not be correct to say that as the dummy AGE30m has negative sign, the fact that a coordinator is younger than 30 years causes her project to face worse chances than if the coordinator were in her forties, say. The correct interpretation would be simply that young coordinators typically submit proposals which get rejected more often. This CAN be brought about by the coordinator’s youth, of course, but also by some other fact: maybe young coordinators are not experienced enough to formulate winning projects. The model is not in a position to distinguish between these two (and possibly other) reasons for rejection. In this sense, the estimated differences are EX-POST rather than EX-ANTE.

¹⁴ A re-estimation of the model with only significant variables included yielded only marginally different coefficients.

Table 7: Simulated percentage difference in approval rates vis a vis the “benchmark project”¹⁵

Variable	% Difference in approval rate	
Age30M	-19.3	
Age30_40	-0.3	
Age50_60	-4.3	
Age60_70	-6.3	
Age70P	-9.9	
NumberProjects	-2.3	
Prof	12.5	
sem2	-3.7	
Technical Sciences	-8.5	
Human Medicine	-15.1	
Agriculture&Forestry, Vet.Med	-18.1	
Social Sciences	-19.2	
The Humanities	4.5	
Sex	2.3	
SingleFoS	-6.3	
DiffFoS2	-3.1	
DiffFoS1	-1.5	
PercentFoS1	0.0	
Sum50M	-15.3	
Sum50_150	-7.2	
Sum250_350	7.3	
Sum350_450	4.1	
Sum450P	-0.1	
Foreign	8.0	
Private	-5.9	underlying coefficient significant at 10% level
OeAW	16.2	underlying coefficient value significant at 5% level
UNI	6.4	
TU	-1.1	
incRD	20.7	
publicRD	11.7	

source: own calculations on the basis of FWF data

Against the benchmark co-ordinator (male, 40-50 years old, no professor) who by the way faces a 52.4 % chance of approval, either very young (<30 years) or very old co-ordinators (>70 years) experience appreciably higher rejection rates (their approval rates are almost 20 – or, in the case of the old coordinator, 10 – percentage points lower). A professor would have submitted a proposal which in a further 13 cases out of 100 would have been accepted; a female co-ordinator would have succeeded in 54.7 % of submissions (=52.4 + 2.3).¹⁵

As already highlighted in the single-dimension analysis at the beginning of this chapter, projects of different scientific flavour face significantly different chances: against our benchmark project, which belongs to the *Natural Sciences*, proposals in *Agricultural* and *Social Sciences* are rejected far more frequently (their approval rates are about a third lower); only *the Humanities* are (slightly but significantly) more successful.

Also as a corroboration of earlier results, the solicited sum makes a substantial difference: very small proposals (<50 k€) are 15 %points less likely to be successful than the benchmark project (which is in the 150-250 k€ class). Contrary to the one-dimensional analysis (and as an example of the advantage of a multivariate model over single-dimensional, descriptive analysis), the largest proposals (>450 k€) no longer face the highest propensity to succeed (cf. Figure 2, left part): in the multivariate setting, it is the “mid-sized” projects, those in the 250-350 k€-range, which seem to

¹⁵ All percentage values must be interpreted “ceteris paribus”: a simple addition of a certain combination of variables is not permissible, because the probit model is NOT linear in its parameters! The effect of a certain combination would again have to be simulated.

be most successful. Two of the reasons why in the one-dimensional description the most expensive projects seem to have a comparative advantage are that such projects much more often belong to the *Natural Sciences* with their above-average approval rates (65 % of the most expensive projects belong to this group, vs. 48 % of all projects) and they are more often coordinated by a professor (79 % vs. 68 %); according to the multivariate model, both these facts exert a positive influence on a project's chances. To sum up: very expensive projects seem to have an advantage not *per se*, but courtesy of their otherwise favourable conditions.

Institutionally, co-ordinators belonging to a University, are rejected less often than the benchmark co-ordinator (their approval rates are 6 points higher); a background at a Technical University, however, seems not make a difference. Appreciably better approval rates can be observed for the other institutions: co-ordinators from public R&D organisation, incorporated R&D organisations and the Austrian Academy of Science (OeAW) see their projects approved much more often than their peers from other institutions.

An ambiguous picture arises for inter-disciplinarity: projects citing only one field of science are rejected more often than projects with more than one (as implied by a value of -6.3 % for the variable SingleFoS). On the other hand, projects with either more than one 2-digit OR more than one 1-digit fields of science seem to face worse chances as well. The solution to this puzzle is that it is projects with two or more closely related fields (which are different only at the 4-digit level) which experience the highest approval rates: an example being a project which cites the fields 1406 and 1423 (*Zoology* and *Experimental Zoology*), say. This would not be a single-FoS project, but would not exhibit different 2- or 1-digit codes either.

Interestingly, the number of a co-ordinator's proposals is negatively correlated with the outcome. On second thoughts, however, this is not so puzzling after all: quite often, rejected proposals are – after some amendments – re-submitted. As a tendency, therefore, the higher a coordinator's number of projects, the higher is the share of rejected proposals.

As the last item, proposals which are decided upon in the second half of the year (between July and December) are rejected somewhat more often (their approval rates are – *ceteris paribus* – almost 4 % lower than those of proposals which are dealt with in the period from January to June). The reason might be that the older the year, the “more finite” the fund's coffers present themselves.

2.4. SOME WORDS ABOUT THE RATING SYSTEM

Each application is subject to peer review. The decision whether to approve or reject a certain proposal crucially depends on the outcome of this review process. The number of reviewers depends mainly on project size (the larger a project, the more reviews are solicited); the minimum, however, is two reviews per application. Whereas ten years ago, a majority of reviewers were based in Austria, now almost all reviewers have an international affiliation.

Applicants can suggest reviewers, although the FWF of course is not obliged to follow this suggestion. Applicants, however, have the right to exclude reviewers, if they can present sufficient justification (for example, to keep scientific competitors from gaining undue insight).

Reviewers submit a written assessment of the project under consideration. To supplement this verbal statement, reviewers are asked to rate the project on a scale from 0 to 100 (with 100 being “the best” rating). The present chapter shall take a closer look on this numerical rating system.

Before delving into a quantitative analysis, however, a couple of caveats are in order which should be borne in mind when analysing the rating system:

- Although they are asked to assign values on a 100-point scale, some reviewers still use the old scale with just 3 grades (1...excellent, 2...good/medium, 3...inadequate). Additionally, if reviewers refuse to rate an application numerically, a rating is assigned by an FWF administrator. In such cases, the 3-grade scale is used as well. All in all, about 7 % of all ratings were using this 3-grade scale.
- As the FWF’s experience shows, the “meaning” of rating values strongly depends on fields of science (mathematical projects are rarely given top marks, for example) as well as on the cultural background of the reviewer (a rating of, say, 50 implying a “medium” project for a reviewer of nationality X, but a “bad” project” for a reviewer of nationality Y)
- The actual decision, whether a project is approved or rejected, is NOT based predominantly or even solely on its rating, but almost exclusively on the verbal assessments. Rather, very unequal values in the numerical ratings are taken to identify “contentious” projects whose assessments warrant closer inspection. It also might lead to the soliciting of further reviews to act as arbiters.

Nonetheless, a closer look at the “predictivity” of the rating system seems interesting enough to carry out the following analysis. In this, the binary-choice model of chapter 2.3 will be re-estimated, but now using an application’s ratings as additional independent variable. If the rating system perfectly predicted the final decision of rejection or approval, all other variables should become insignificant (their contribution to the predictive power of the model should drop to zero).

The new, augmented model uses the average of each project’s numerical ratings. To check whether highly unequal ratings have any effect on the outcome of the decision process, the standard deviation of a project’s rating is included as well. Additionally, the number of reviews per project is included.

The following Table 8 shows the results of the augmented model as well as the results of the original model¹⁶.

Table 8: Regression results for the Binary Choice model, with and without inclusion of Rating

Dependent Variable: GRANTED_01

Method: ML - Binary Probit (Quadratic hill climbing)

Included observations: 2596 after adjusting endpoints

Variable	including rating		without rating	
	Coefficient	Prob.	Coefficient	Prob.
C	-4.8889	0.00	0.1370	0.44
Age30M	-0.4972	0.07	-0.5928	0.01
Age30_40	-0.0075	0.92	-0.0573	0.39
Age50_60	-0.1594	0.02	-0.1422	0.03
Age60_70	-0.2356	0.05	-0.1347	0.22
Age70P	-0.1305	0.68	-0.4109	0.15
NumberProjects	-0.0081	0.63	-0.0759	0.00
Prof	0.1438	0.05	0.2776	0.00
sem2	-0.1160	0.04	-0.1186	0.02
Technical Sciences	0.0530	0.67	-0.1660	0.14
Human Medicine	-0.1213	0.11	-0.3813	0.00
Agriculture&Forestry, Vet.Med	-0.0456	0.84	-0.3517	0.08
Social Sciences	-0.2576	0.05	-0.4936	0.00
The Humanities	-0.1330	0.19	0.1141	0.20
Sex	-0.0132	0.87	0.0107	0.89
SingleFoS	-0.0926	0.45	-0.1169	0.29
DiffFoS2	-0.0453	0.26	-0.0614	0.10
DiffFoS1	-0.0619	0.21	-0.0669	0.14
PercentFoS1	0.0007	0.73	0.0007	0.68
Sum50M	-0.2225	0.13	-0.2813	0.02
Sum50_150	-0.0751	0.26	-0.1977	0.00
Sum250_350	0.0639	0.43	0.1535	0.04
Sum350_450	-0.2290	0.08	-0.0165	0.89
Sum450P	-0.2630	0.17	0.0727	0.69
Foreign	0.1467	0.66	0.2341	0.44
Private	0.2257	0.79	0.3561	0.59
OeAW	0.4621	0.02	0.4710	0.01
UNI	0.3451	0.02	0.2572	0.04
TU	-0.1214	0.10	-0.0079	0.91
incRD	0.6526	0.02	0.6689	0.01
publicRD	0.3448	0.12	0.3241	0.10
average rating	0.0583	0.00		
standard deviation of rating	-0.0038	0.37		
number of reviews	0.0776	0.03		
McFadden R-squared	0.202		0.049	
Obs with Dep=0	1240		total obs.	2596
Obs with Dep=1	1356			

coefficient significant at 10% level
coefficient value significant at 5% level

Source: own calculations on the basis of FWF data

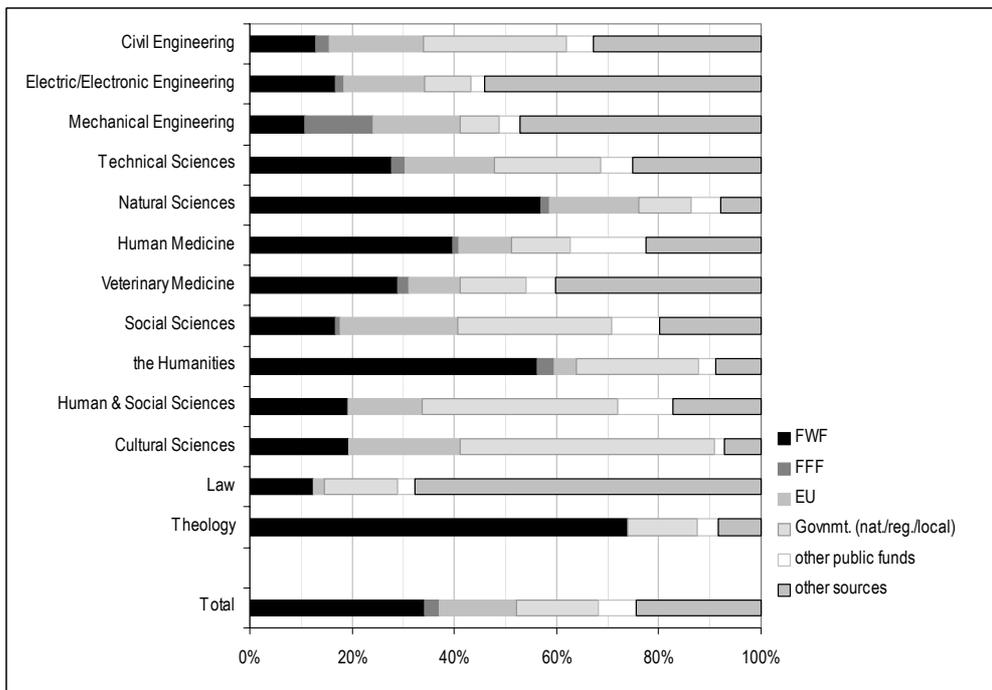
¹⁶ The coefficients, though, are somewhat different from the results as presented in chapter 2.3. The reason is that now we have a smaller sample of applications: whereas above, the sample comprised 4014 projects, this number is now only 2596. The reason is that ratings are not available for all projects, and that for some projects, both the old as well as the new rating scales were used. As these two scales are not comparable, only such applications were included in this analysis which were exclusively rated on the new scale

The results are quite clear: the fit of the augmented model, at an R^2 of 0.20, is much higher than the fit of the original model ($R^2=0.05$). Also, the number coefficients which are significant at the 10 % level drops from 16 to 10 (excluding the constant and the rating variables). Rating's average and standard deviation show the expected sign: the higher the rating, the higher the chance of approval, whereas very unequal ratings diminish a project's chances (the coefficient on the standard deviation, though, comes out insignificant). Interestingly, the number of reviews is also estimated to positively influence the decision outcome (this reflects the fact that larger projects, for which typically more reviews are solicited, also face higher approval rates).

2.5. RELEVANCE OF FWF FUNDING FOR THE UNIVERSITY SYSTEM¹⁷

As was shown above, some 85 % of applications for FWF funding are submitted by coordinators which are affiliated with an Austrian University. This already hints at the eminent relevance of the FWF for the University system in Austria. To further clarify matters, the following Figure 5 shows, for faculty groups of Austrian Universities¹⁸, the structure of external funds. Six sources of external funds are distinguished: FWF, FFF, European Union (EU), the Government (on the national, regional, or local level), other public funds, and "other sources" (meaning, in essence, private research contracts. Private charitable endowments, which would also fall into this category and which in other countries, notably the USA, are of major importance, are almost non-existent).

Figure 5: University Faculties: structure of external Funding, ϕ 2000-2002



Source: ABIV (OeUK), own calculations

¹⁷ The following analyses are based on the "Reports of the Heads of Institute" (*Arbeitsberichte der Institutsvorstände, ABIV*), which are collected by the "Austrian University Council" (*Österreichisches Universitätskuratorium OeUK*). All institutes of scientific Universities (as opposed to teaching or artistic Universities) have to participate in this annual survey on a mandatory basis. Besides external funding, the survey includes questions on publications, staff, and teaching. Since 1997, it was conducted on an annual basis.

¹⁸ At Austrian scientific Universities, institutes are organised in faculties, whose scientific "themes" broadly coincide with one of the 6 i-digit fields of science (cf. above). In total, there are 18 different faculties, plus 4 Universities which are not organised along faculty lines (Montanuniversität Leoben, Universität für Bodenkultur, Wirtschaftsuniversität Wien, Veterinärmedizinische Universität). These 22 units were aggregated into the 13 "faculty groups" used in this chapter.

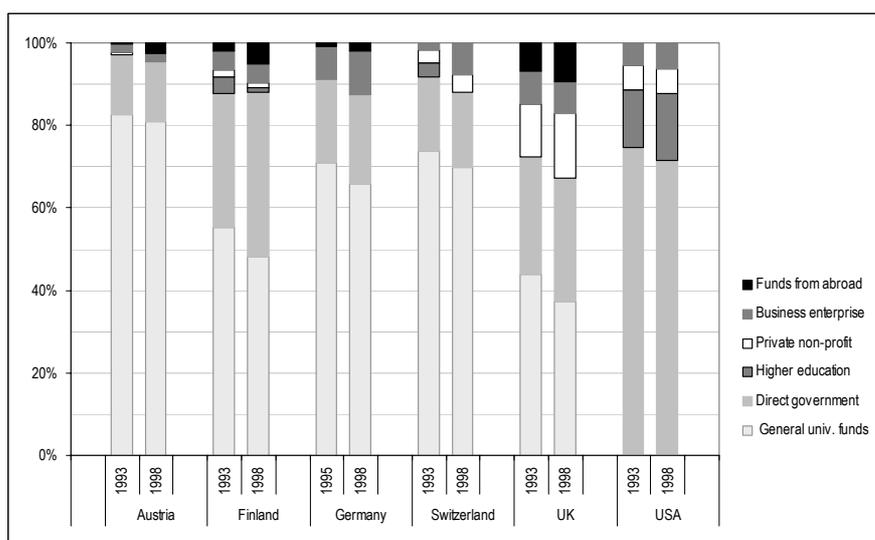
On average, Austrian institutes rely on the FWF for more than a third (34.3 %) of their external funding (“other sources”, with almost 25 %, have the second-highest share). Unsurprisingly, the FFF, dedicated to the advancement of *industrial* R&D, with a share of only 3 % is the least important source of external funding.

As often happens, the mean tends to obscure the finer picture: whereas the engineering faculties (and Law) draw on the FWF only for some 10-15 % of their external funding, the FWF’s share is more than half for the faculties of *Natural Science, the Humanities, and Theology*.

The low importance of FWF funding for the faculties *Social Sciences* and *Human&Social Sciences* might be a consequence of the existence of the Austrian Central Bank’s ‘Jubiläumsfonds’, with its exclusive focus on projects in the social sciences, the humanities, and human medicine¹⁹. Figure 5 reflects this arrangement: whereas the other faculties’ average share of “other public funds” (which includes the ‘Jubiläumsfonds’) is about 5 %, the “target faculties” for the ‘Jubiläumsfonds’ (*Social Sciences, Human & Social Sciences, the Humanities, Human Medicine*) on average get more than 12 % of their external funding from these sources.

Summing up, the FWF is an important source of external funds for the Austrian university system. External funds, however, are of less importance than would be expected, as highlighted by the following international comparison.

Figure 6: Sources of HERD²⁰, 1993²¹ und 1998



Source: OECD; own calculations

The share of external funds (i.e. funds other than the *General University Fund, GUF*) is rather low: although somewhat diminishing, *GUF* in 1998 still represented more than 80 % of HERD, a higher share than in all OECD countries with comparable data. Adding external funds from public sources (*direct government*: public research funds, public research contracts) raises the HERD’s “public share” to 95 %, a higher share than in any OECD-country bar Slovakia (and on a par with Denmark). In Germany, Finland and Switzerland, the respective public share is between 80 and 90 %, which, though substantially lower than in Austria, is still markedly above Anglo-Saxon values of 70-75 %.

¹⁹ In 2002, the Jubiläumsfonds disbursed some 12.4 Mio €, as compared with 66.7 Mio € which were granted by the FWF (only projects - excluding all scholarships, mobility grants, etc.).

²⁰ Higher Education Expenditures on Research and Development – Ausgaben

²¹ Germany: 1995; Switzerland: average 1992/1994

Similarly skewed is the composition of public sources, i.e. the mix between *GUF* and *direct government* (which can be employed in a much more targeted fashion than *GUF*): in Austria, the proportion between those two sources of funding is about 85:15; among OECD countries with comparable data, typical rates would be 50 to 80 % for *GUF* (only the Netherlands exhibit a higher *GUF* share, of some 90 %. On the other hand, the Netherlands' total public share, at 83 %, is much lower than Austria's 95 %).

2.6. "OUTPUT EFFICIENCY" OF FWF FUNDING

The data base mentioned in the last chapter, the *ABIV*, puts us in a position to estimate the effect of FWF funding on a major aspect of scientific output, i.e. publications. The *ABIV* not only contains data, at the institute level, on various types of publications (monographs, original articles, SCI/SSCI/AHCI-publications, research reports, patents, presentations at scientific symposia, other scientific publications), but also information about external funds and their sources: European Union (Framework Programmes), FFF, FWF, other public funds, natl/regl/local Government, other sources (i.e., non-public funds: private research contracts, charitable endowments). The data are available for some 980 institutes from all 12 scientific Universities.

There are, however, a couple of problems with this data base. First of all, it does not contain information on "basic" funds (General University Funds – *GUF*). On average, this "basic subsidy" provides for almost 85 % of *HERD* (Higher Education Expenditures on R&D), a higher share than in almost any other OECD country²². The second problem is a certain lack of enthusiasm of the participants in this survey. Although institutes of scientific Universities are required to participate, the reports they finally deliver are not checked for plausibility. As a result, there is some evidence that, especially in the early years of the survey (as an annual institution, it was started in 1997), the data are less than complete. This shortfall, however, seems to vanish (or, at least, diminish) for the more recent years.

The last problem has to do with the definition of the data on external funds. Two different numbers are requested, none of which is well suited for efficiency analyses. The first number is the "total financial volume of projects which were *finished* in the reporting year", the other is "annual payouts, averaged over the last three years". The first of these variables is clearly of limited value, as the duration of the projects is not taken into account. The other's drawback is its limited attributability to a specific year.

Despite these caveats, the data base provides valuable institute-level information. In the following, we aim at identifying the effects of the various types of external funding on publication output. To allow for different responses due to scientific peculiarities, the institutes were manually assigned to one of six broad fields of science: natural sciences, technical sciences, human medicine, agriculture/forestry/veterinary science, social sciences, and the humanities.

Given the qualifications concerning the quality of the data base, we employed simple pooled regressions. The dependent variables were the 7 types of publications plus a weighted sum of all publications, the so-called "publication activity". The weights in this activity index are intended to reflect the relative "values" of the different types; following to the OeUK, this index was calculated as

monographs can mostly be found in the social sciences and the humanities, along with human medicine. Patents are the preserve of the natural and technical sciences. For the technical sciences, presentations are of only marginal importance; again, it is human medicine which dominates this type of publication.

As for the different sources of funds, almost all significant coefficients have the expected sign (a positive association with the number of publications), the exception being monographs, which seem to be negatively correlated with FFF funding. This might, however, be a statistical artefact: the overall importance of FFF funding is very low (only some 4 % of all external funds are provided by the FFF, which is not surprising, as the FFF's target group is industrial firms, not scientific institutes). Additionally, in fields where monographs are an important type of publication, human medicine, social sciences, and the humanities, FFF funding is virtually non-existent.

The FFF, on the other hand, has the highest coefficient in the equation for patents, which is very plausible, although the coefficient, at 0.0011, is (just) not significant at the 90 % level (its prob-value is 87 %). Additionally (and plausibly), FFF funding positively and significantly influences the number of research reports.

Along with "other sources", FWF funding seems to bear positively on all types of publications; only "other publications", although positive, seem not be significantly linked to this source of external funding. EU funding is mainly connected with scientific articles and their subset, SCI publications.

Typically, the coefficients for the FWF are among the highest of all sources of funds, implying quite strong "efficiency of funding" (i.e., a high number of publications per Euro of funding); typically, it is only "other public funds" which surpass the FWF in this respect (typically, these are very focused funds as opposed to the "broad" FWF. They are especially important in the social sciences and human medicine, cf. Figure 5 in Chapter 2.5)

3 Implications of the FWF-support: results of a survey of FWF customers

3.1. SURVEY APPROACH AND SAMPLING

As part of the evaluation of the FWF a survey was conducted. Two types of questionnaires for FWF-applications (for the successful and non-successful) were developed aiming at assessing the experiences and motivations for researchers to submit research proposals to the FWF. The survey was constructed in a way that recipients of FWF funding were asked more specific questions about the experiences and impact of FWF funding and the questionnaire for the non-recipients was focused on the possible reasons for the rejection out of the view of the researchers. Concerning the self-positioning of the researchers as well as the preparations of the proposal the two questionnaires were identical for reasons of comparison.

The restriction of our survey to the project level was mainly due to the already existing survey-results conducted on behalf of the FWF itself. A market research institute conducted this wide-ranging survey among persons engaged in scientific activities. The main goal of the FWF with this survey was to gain information on the experiences (or non-experiences) researchers have with the FWF.²³ The aim of our survey was thus to evaluate the impacts of the FWF-funding, rather than the general awareness and assessment of scientist and researchers in relation to the FWF in general.

This implies that the sampling was among the projects rather than individual researchers; hence the unit of analysis was the submitted project. For the sampling we used the FWF database and specifically the e-mail addresses of the project leaders. To keep costs low, the survey was conducted via email. For each application in the FWF data base, its project coordinator was sent an electronic questionnaire. By this design, however, not all applications could be covered in the survey; rather, only those for whose coordinator an email address was included in the FWF data base were addressed (anyway, these accounted for about 90 % of all applications). Additionally, each project coordinator was confronted with a maximum of 4 questionnaires. Finally we restricted our sampling on scientific projects, special research programmes (SFB) and joint research programmes (FSP) thus concentrating on the 'project-based' activities of the researchers. Moreover, these programmes cover about 83 % of the total funding portfolio of the FWF (or 90 % of the regular FWF-budget). Although there is a range of funding programmes aiming at training and mobility of researchers it would have been rather difficult to capture the main effects of the FWF mobility programme via a questionnaire – apart from the difficulty to find the current email addresses of the researchers.

A total of 3180 questionnaires was thus sent to some 2000 project coordinators, consisting of 1964 funded projects and 1216 rejected proposals. 109 questionnaires were undeliverable, resulting in a basic population of 3071 questionnaires. Out of this basic sample 1630 questionnaires were returned, implying a response rate of 53 % (see Table 10).

²³ For more information see: http://www.fwf.ac.at/de/aktuelles_detail.asp?N_ID=75

Table 10: Response rate of the survey

	basic population	response	response rate
funded projects	1964	1138	58%
rejected proposals	1216	492	40%
undeliverable	-109		
total	3071	1630	53%

Source: survey

The main issues of the survey were:

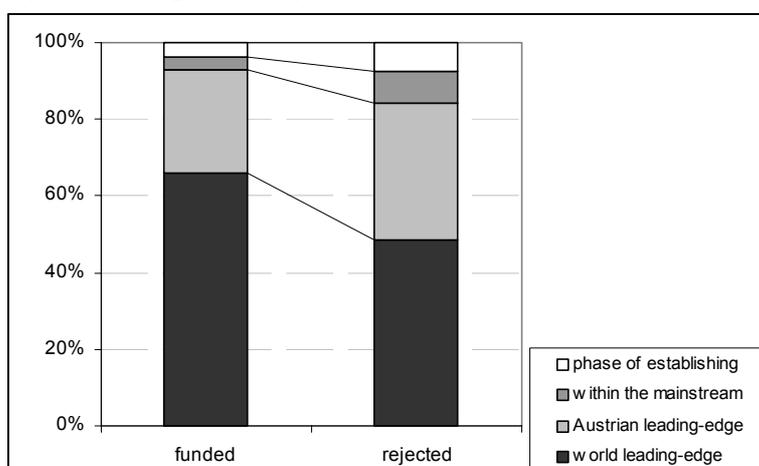
- Characterisation of the institute or research localisation (for both approved and rejected proposals)
- Characterisation of the research project/proposal (for both approved and rejected proposals)
- Characterisation of the results (only for approved proposals)
- Characterisation of the impacts on the individual researchers (only for approved proposals)
- Characterisation of the rejected proposal (only for rejected applications)

The following section aims at identifying the differences between coordinators of approved and rejected proposals concerning their characterisation of the projects/proposals as well as the objectives they tried to attain with the FWF-project. All results are based on the questionnaire, hence representing the view and self-perception of the researchers.

3.2. DIFFERENT ASSESSMENTS OF DIFFERENT AIMS BETWEEN APPROVED AND REJECTED PROPOSALS

The self-positioning of the institute or research unit in terms of the attitude towards different statements shows some interesting results. In total, some 60 % of all project coordinators who submit a proposal at the FWF rate their research unit among internationally leading research units. However, while 66 % of the coordinators of the funded projects see their institute at the leading edge worldwide, this rate decreases to 48 % for rejected proposals (see Figure 7). This gives a first hint that the customers of the FWF work at institutes or research units which are part of the internationally leading research community.

Figure 7: Self-positioning of the institutes / research units



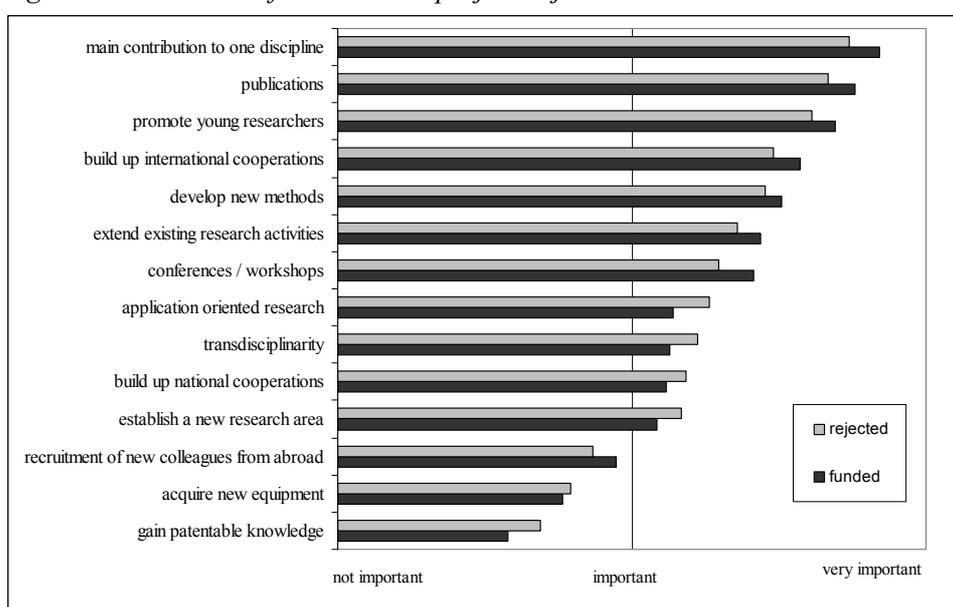
Source: survey

Although not internationally leading, 36 % of the coordinators of rejected proposals see themselves as one of the strongest research units in their field in Austria. Only a minor part within both

groups assess their work within the mainstream of the discipline or deal with their self-positioning within the discipline, respectively.

As to the intended aims of the application, the submitters of FWF proposals see their projects as a main contribution to an advance in knowledge in their scientific discipline. This corresponds with the self-positioning of the research institutes at the leading edge of the research activities. In addition, both groups, the funded as well as the rejected proposals, rate publications and the promotion of young researchers quite high although the items ‘contribution to one discipline’, ‘publications’, ‘promotion of young researchers’, and ‘international cooperations’ differ significantly between the funded and rejected projects at the 5 % level. FWF projects are used more often to extend already existing main research activities and less to establish new main research activities at the research unit, which is thus rated lower.

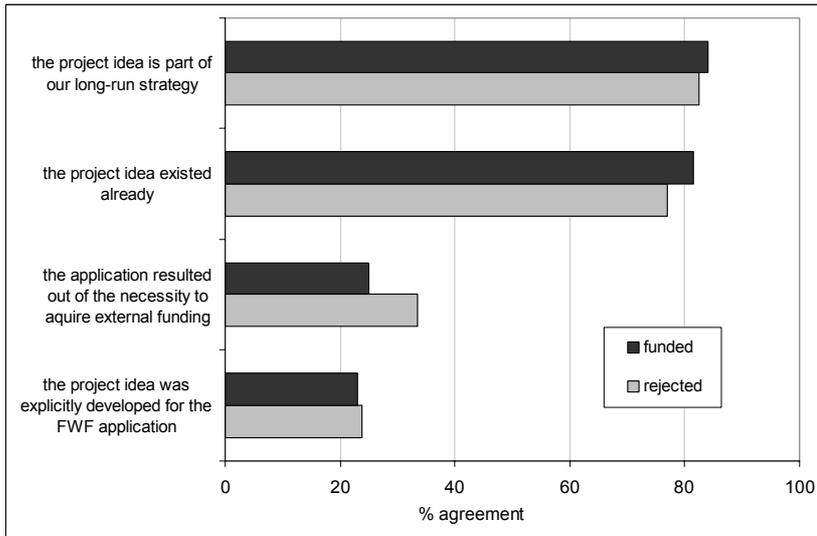
Figure 8: Assessment of the research project objectives



Source: survey

The submission of proposals based on already existing strengths and main research activities finds its analogy in the description of the research proposal: an overwhelming part of all submitters (more than 83 %) hold their application as part of a long-run research strategy within their research unit. Accordingly, 80 % of all respondents agreed that the project idea had already existed for some time (Figure 9). The necessity to acquire external funding is valid for 25 % of the funded and for 33 % of rejected projects. Only a minor part of the research ideas was explicitly developed with FWF funding in mind. One can conclude that FWF funding is based on existing research foci and is used in order to strengthen specific research orientations.

Figure 9: Conception of the project



Source: survey

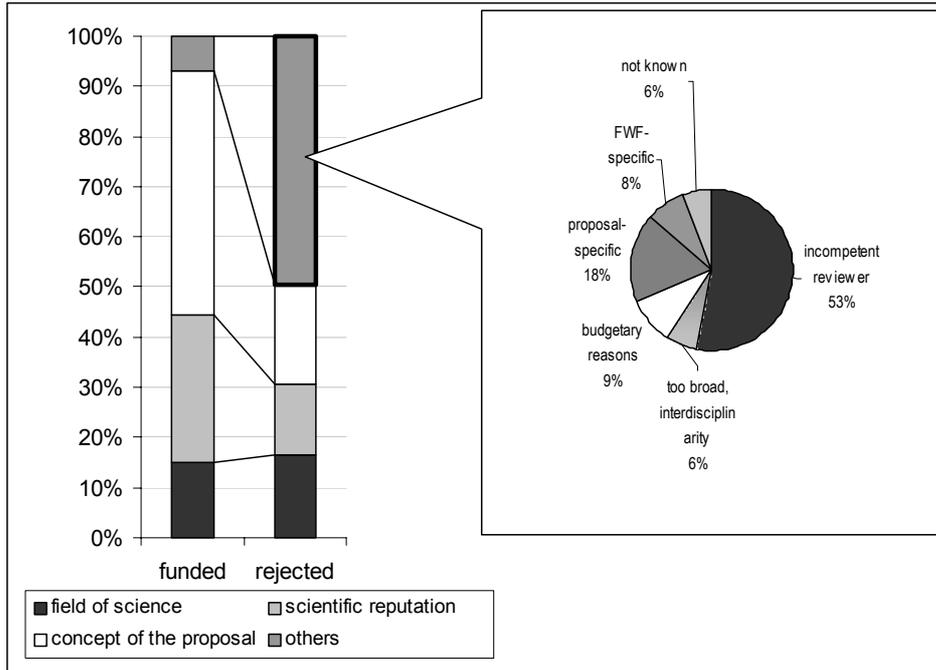
3.2.1 Project assessment – ex-ante evaluation

All scientists who submit a project proposal to the FWF are submitted to a peer review process. Only scientists with an international affiliation are requested to review proposals. Their reviews build the basis for all decisions on funding. The idea behind such a system is to guarantee the quality and the international relevance of the research financed by the fund. Additionally, the independence of an external reviewer should ensure the objectiveness. It is obvious that the subjective perception of the project leaders concerning the review process differs a lot – not least depending on the decision and assessment of the proposal.

However, it seemed to us quite interesting to analyse the (subjective) view of submitters of proposals on the main reasons for approval / rejection. We thus asked all submitters to give weights to possible reasons for the decision of the reviewers: the project’s field of science, the scientific reputation of the project coordinator, the excellence of the proposal and the open category ‘others’. The specific weights sum up to 100 %.

It is self-evident that the excellence of the proposal was weighted highest (with nearly 50 %) among the coordinators of funded projects (see Figure 10). Scientific field, at 15 %, and the scientific reputation of the project coordinator (with 30 %) both were perceived as less important for the decision. This picture changes for the group of rejected proposals: the open category ‘others’ was rated highest by the unsuccessful applicants. However, most of the respondents responded to this open question by providing their personal opinion for rejection. Although it is difficult for analytical reasons to find clear-cut categories we tried to cluster the answers into six different groups. The overwhelming part of the submitters (53 %) to some extent blame the “incompetence” of the reviewers or a poor selection of reviewers. 6 % of the rejected coordinators find that the inter- or transdisciplinarity of the proposal was a problem for the evaluators to adequately assess the proposal. Also included in this group are those who see the concept of the proposal as too broad

Figure 10: Weight of reasons for funding / rejection



Source: survey

For 9 % of the coordinators, a perceived lack of financial resources (mainly on the side of the FWF) is the main reason for rejection. 18 % of the submitters are rather self-critical: they hold some deficiencies of the proposal (lack of time for the preparation, lack of quality, ...) for the crucial factors of rejection. Another 8 % mentioned the FWF itself in their explanation (FWF as a “closed club”, insider relationships, lack of willingness to cooperate with the project coordinators, ...) for rejection and 6 % of the respondents hold other reasons for crucial although they did not respond to this open question.

From a field-of-science point of view the subjective assessment of the reasons of rejection are quite specific: Three fourth of the researchers in the technical sciences hold incompetent reviewers for the main reason whereas the broadness of the project concept does not seem to be a problem. On the other hand, coordinators in the social sciences and the humanities are much more self-critical, citing proposal inherent reasons as crucial. Additionally, the broadness of the research idea is quite characteristic for the rejection of proposal out of social science: one fourth of the answers find the interdisciplinarity and broadness of the research idea as the main reasons for rejection.

Table 11: Reasons for rejection by field of science (only rejected proposals)

	Natural Science	Technical Science	Human Medicine	Agriculture, Forestry, VetMed	Social Sciences	Humanities
incompetent reviewer	55	75	62	60	41	25
too broad, interdisciplinarity	6	0	1	0	26	7
budgetary reasons	10	8	6	10	4	16
proposal-specific	15	13	17	10	26	27
FWF-specific	9	0	8	20	0	9
not known	4	4	6	0	4	16
Total	100	100	100	100	100	100

Source: survey

The questionnaire for the unsuccessful applications included a question related to the deficiencies of the proposal, i.e. beside external reasons (which was mentioned above) we wanted to know the

applicants' view about possible internal deficiencies in the preparation process of the proposal, which finally resulted in the rejection.

Generally, most of the respondents of the rejected proposals saw the concept of the research idea as too broad or the aims as too little focused respectively. Nearly 40 % of the respondents who indicated at least one of the items see the broadness of the concept as one of the main reasons for rejection. For another 35 % the concept was not focused enough. Thus three fourth of the respondents of rejected proposals hold their proposal as too broad conceptualised.

Quite surprising was that 25 % of the respondents cite inexperience with the submissions of research proposals at the FWF as one reason for the negative outcome although one fourth of the respondents with rejected proposals already had between 1 and 6 funded projects – maybe an statistical artefact. Insufficient internal support is generally seen as a minor problem, with the exception of the applicants from human medicine who see a lack of internal support during the preparation process.

Table 12: Deficiencies during the preparation process by science field (only rejected proposals)

	Total	Natural Science	Technical Science	Human Medicine	Agriculture, Forestry, VetMed	Social Sciences	Humanities
concept was too broad	39,4	38,2	32,1	45,6	41,7	35,9	37
too littel focused	35,3	35,6	28,6	28,2	66,7	46,2	37
other reasons	27,2	30,4	28,6	25,2	16,7	20,5	26,1
too little experience with FWF	25,8	18,3	32,1	35	8,3	25,6	37
hypotheses insufficient specified	21,7	18,8	21,4	21,4	50	30,8	19,6
concept was too little elaborated	21,2	19,9	25	17,5	33,3	30,8	21,7
too littel rressources for application	10,5	6,3	17,9	9,7	8,3	12,8	23,9
criteria of funding insufficient known	10	7,3	3,6	11,7	0	15,4	19,6
insufficient internal support	5,7	2,6	7,1	12,6	0	5,1	4,3

Source: survey

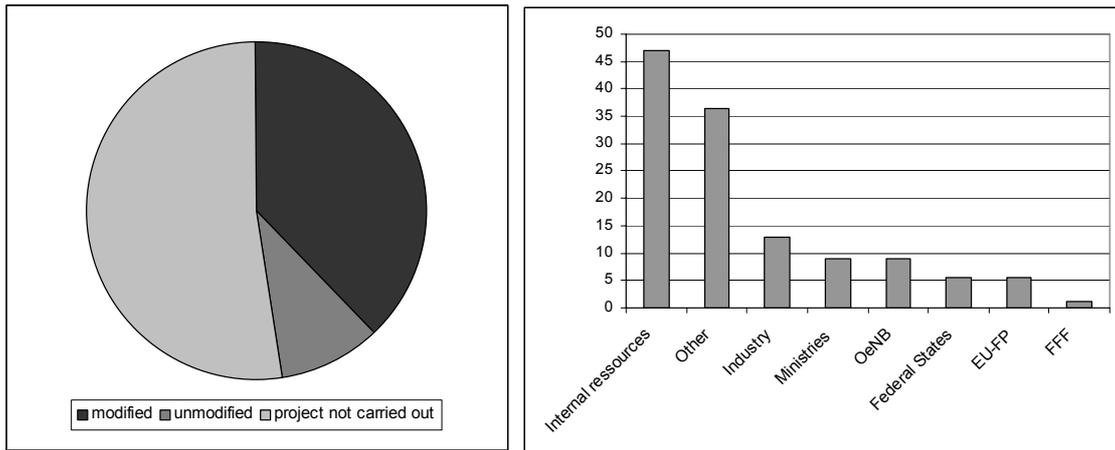
3.2.2 Future of rejected proposals

It is quite important for an evaluation to capture the question of what happened with rejected project-proposals. Does the submitters of the proposals carried out the project without any change, slightly modified or were the project stopped altogether? One could assume that the higher the importance of the project idea the higher the probability that it is carried out even in the case of rejection by the funding organisation. Either the project will be funded by internal sources or by other external funding sources. The final question for the rejected project submitters was related to the implication of a rejection (Figure 11).

The answers show that 52 % of the project proposals were not carried out. On the other hand, 48 % of the respondents answered that they carried it out either as planned or in a slightly modified way. This relative high percentage confirms the finding that the proposals existed already in advance and/or were part of a long-run strategy of the research unit. FWF proposals are of high importance for the researchers and for the research strategy of the institute.

We further asked those who carried out the project despite rejection by the FWF if and what other sources were drawn upon. The overwhelming part of the coordinators responded that the institute-internal budget was used for carrying out the project.

Figure 11: The implication of the rejection (only rejected proposals)



Source: survey

3.3. OUTPUT & IMPACT OF FWF-FUNDED PROJECTS

The following section aims at the characterisation of the results and the impact of FWF-funded projects according to the response of the questionnaire. The analysis thus considers only the successful (i.e. funded by the FWF) projects.

Distinguishing between scientific and popular-scientific output we identify different patterns of output for the six main fields of sciences. In addition, commercial results and potential commercial usability are taken into account. As for the characterisation of impact, attention is paid to the effects of the projects on project managers as well as the project team. Additionally, societal implications of the projects are taken into account.

3.3.1 Patterns of the project team

Out of the accepted FWF-projects in the sample, 35% of the research projects have been completed prior to the survey, whereas 65 % were still ongoing.

Table 13: Distribution of sample by status and fields of science

	<i>Nat. Sc.</i> <i>N~631*</i>	<i>Eng. Sc.</i> <i>N~66*</i>	<i>Med. Sc.</i> <i>N~213*</i>	<i>Agric. Sc.</i> <i>N~13*</i>	<i>Soc. Sc.</i> <i>N~47*</i>	<i>Humanities</i> <i>N~167*</i>	<i>Missing</i> <i>N~1*</i>	<i>Total</i> <i>N~1137*</i>
<i>Ongoing</i>	410	37	149	7	26	104		733
<i>Completed</i>	214	29	62	6	21	60		392
<i>Total</i>	624	66	211	13	47	164	13	1138

*according to FWF database

Source: Survey

Figure 12 depicts the general patterns of FWF-funded project teams according to the qualification of team members. On average 0.55 professors, 0.25 employees in tenure track positions, 0.80 post-docs, 1.20 PhD-candidates and 0.80 MA-thesis candidates are part of a project team. Additionally, 0.47 technical employees and 0.13 administrative employees contribute to a project. One can see that the size of the project team varies to some extent for the different fields of science.

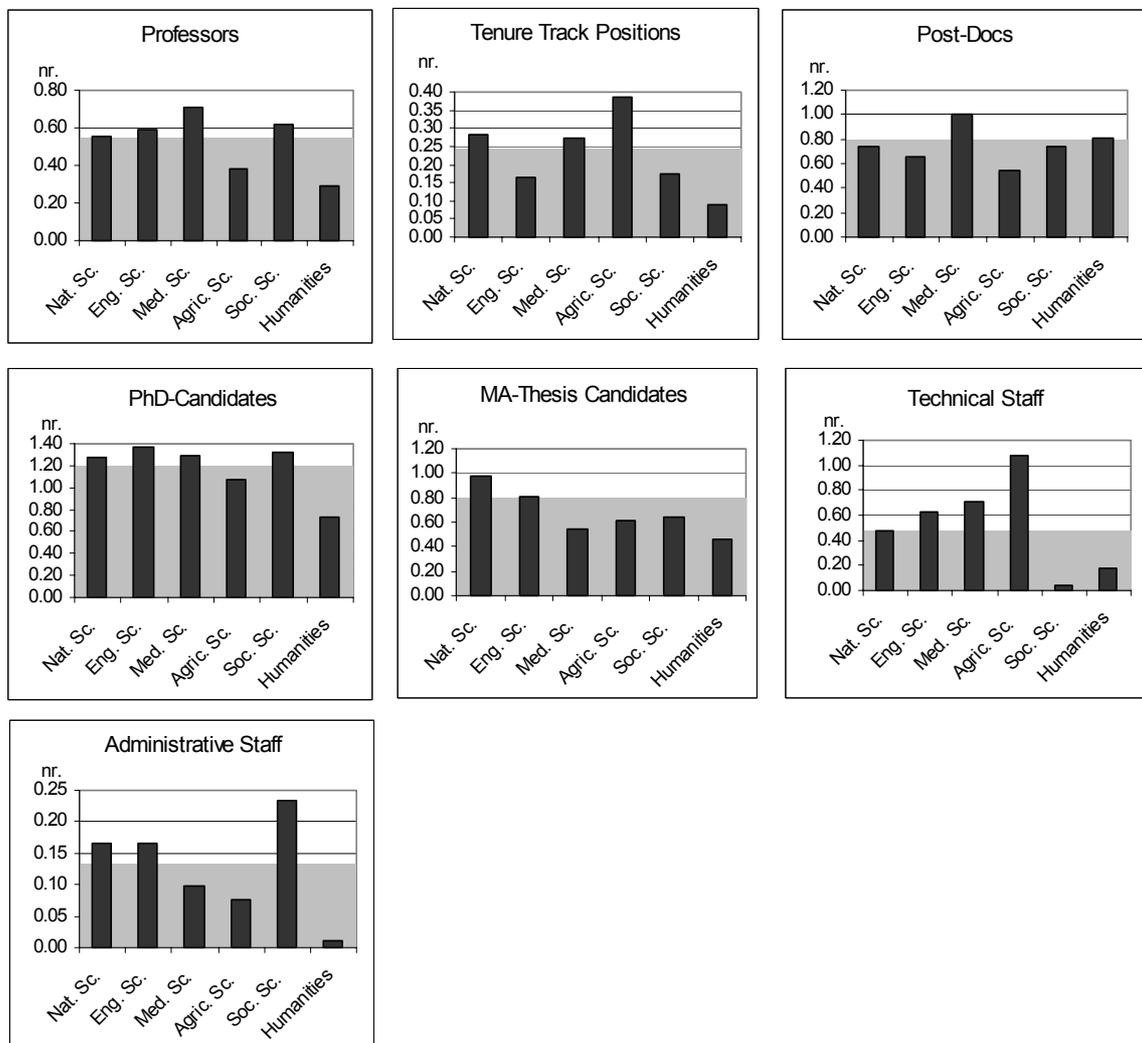
Whereas the number of professors involved in a project is quite evenly distributed between the fields of science apart from the *Humanities* (0.29) and the *Agricultural Sciences* (0.38), the num-

ber of contributors in tenure-track positions varies much more. The *Agricultural Sciences*, the *Natural Sciences* and the *Medical Sciences* exhibit numbers of team members in tenure track positions well above the average whilst in the *Social Sciences*, the *Humanities* and the *Engineering Sciences* the number of team members in tenure track positions is rather low.

The average number of Post-Docs varies only slightly around the average between the fields of science. The same is true for the number of PhD-candidates, except for the *Humanities* where only 0.73 PhD-candidates are involved in a project. The *Humanities* exhibit also a substantially lower number of MA-thesis candidates in their research projects than the remaining fields of science.

As regards the technical staff, the interpretation is straightforward: almost no technical staff is needed for the conduct of a research project in the *Humanities* and the *Social Sciences*. The need for administrative staff however is highest in the *Social Sciences* (0.23) whilst almost no administrative staff members seem to be needed in the *Humanities* (0.01).

Figure 12: Patterns of Project Teams

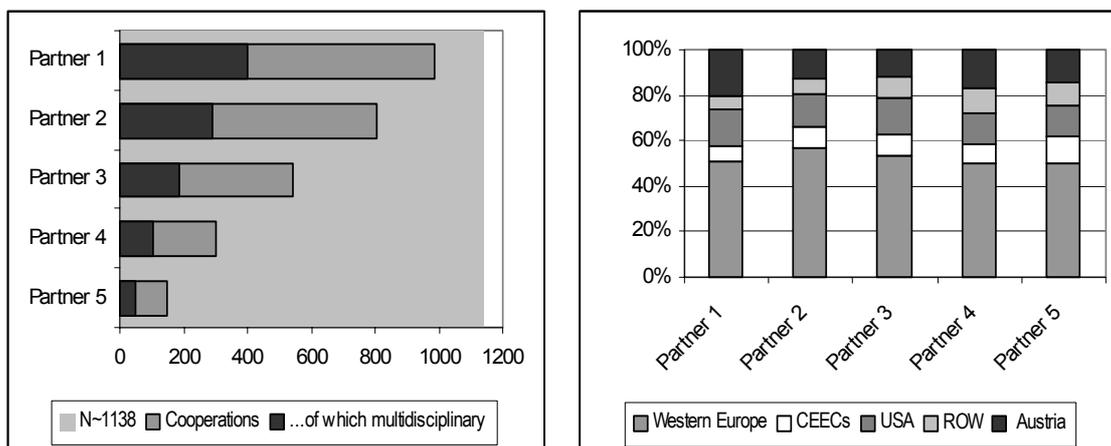


Source: Survey

We further asked about potential research partners, including the origin of the research partner and the multidisciplinary, as shown in Figure 12. Out of the 1138 accepted projects in our sample, 989 (87 %) have at least 1 research partner. About 70 % had at least 2 co-operation partners and some 13 % reported 5 research partners. With 40 %, multidisciplinary tends to be a bit higher for the 1st research partner, but remains at a constant level of about 35 % for the rest of the coopera-

tion partners. The distribution of the countries of origin does not vary a lot among the research partners but reflects a high degree of internationality. About 50 % of the research partners are from Western-European countries, 15 % of research Partners are from the United States of America, 7-10 % are from Central and Eastern European Countries (CEECs) and the Rest of the World (ROW) accounts for about 5 % of co-operations. The remaining 15-20 % represent national co-operations.

Figure 13: Research Co-operation



Source: Survey

3.3.2 Scientific Output of FWF-funded Projects

There was a high overall satisfaction rate with the results of the completed projects with respect to scientific targets: 81 % of the respondents replied that the results of the project met initial targets. The remainder of 19 % of the respondents replied that the results of the project fulfilled the original intention at least in part. Only 1 responding project coordinator (0.2%) did not see the scientific aims fulfilled.

Table 14 illustrates the scientific output of the completed FWF-funded projects: On average a single FWF funded project yields 4.6 publications in peer-reviewed journals, of which 3.6 can be found in SCI/SSCU/AHCI journals. 0.4 publications in peer-reviewed journals were in print; 0.7 publications were still work in progress at the time the survey was conducted. In addition, a FWF-funded project yields on average 1.2 publications in non-peer-reviewed journals, 0.9 scientific reports and 1 scientific book. Non-peer-reviewed journals in print/in assessment/ in progress are ignored, as mean values are nearly 0. During the course of a project, 2.4 invited lectures and 4.9 conference lectures were held on the topic of the ongoing research; about 1 doctoral thesis and 1 diploma thesis were conducted. With an average of 0.16 tenures associated with each FWF research project, they seem not to serve as a major road to tenure.

However, significant differences in scientific output occur when differentiating between fields of science, which might reflect the specific publication culture/tradition of the different fields of science: mean values in which differ significantly between fields of science are marked with an asterisk.

Concerning publications in peer-reviewed journals, projects in the field of *Natural Sciences* are in the lead, producing an average of 5.8 publications per project, followed by *Medical Sciences* (4.8) and the *Humanities* (2.5). Publications in non-peer reviewed journals play a crucial role in the *Social Sciences*, in which these publications exhibit the highest value (3.7), followed by the *Humanities* (1.8) and the *Engineering Sciences* (1.6). Monographs have the highest mean value in the

field of the *Humanities* (1.2) whereas publications of scientific books and presentations at conferences (3.4) are highest in the field of *Social Sciences*. Furthermore, poster presentations clearly are most important in the *Medical Sciences* and the *Natural Sciences*.

Considerable differences by fields of science can be observed for the average number of diploma and doctoral theses which were conducted in the course of a project. In the field of *Natural Sciences* and *Engineering Sciences*, FWF projects contribute in equal shares to diploma theses and doctoral theses. Except from *Social Sciences*, in which projects serve to a bigger extent as vehicles for diploma theses than for doctoral theses, FWF projects provided an opportunity for doctoral theses rather than diploma work. Significant differences at a 5 % level for the mean values of number of dissertations and diploma theses occur between the *Natural Sciences* and the *Humanities*.

Table 14: Scientific Output of FWF-funded projects - Publications

	NAT. SC. Mean (N~214)	ENG. SC. Mean (N~29)	MED. SC. Mean (N~62)	AGRIC. SC. Mean (N~6)	SOC. SC. Mean (N~21)	HUMANITIES Mean (N~60)	TOTAL Mean (N~392)
PUBLICATIONS IN PEER REVIEWED JOURNALS	5.8	2.3	4.8	2.3	1.7	2.5	4.6*
... OF WHICH IN SCI/SSCU/AHCI JOURNALS	4.9	1.4	4.4	2.2	0.6	0.2	3.6*
PEER REVIEWED JOURNALS IN PRINT	0.5	0.3	0.3	0.0	0.3	0.5	0.4
PEER REVIEWED JOURNALS IN ASSESSMENT	0.4	0.1	0.3	0.0	0.3	0.1	0.3
PUBLICATION IN PROGRESS	1.0	0.3	0.4	0.3	0.5	0.3	0.7*
PUBLICATIONS IN NON-PEER-REVIEWED JOURNALS	1.0	1.6	0.5	0.7	3.7	1.8	1.2*
SCIENTIFIC REPORTS	1.1	0.7	0.6	0.3	0.6	0.9	0.9
MONOGRAPHS	0.1	0.2	0.1	0.0	0.5	1.2	0.3*
SCIENTIFIC BOOKS	0.6	0.2	0.3	0.7	4.8	2.5	1.0*
INVITED LECTURES AT CONFERENCES	2.5	0.6	2.9	0.3	3.4	2.3	2.4
LECTURES AT CONFERENCES	5.5	4.6	3.9	2.8	5.5	4.3	4.9
POSTER	4.2	1.1	5.6	2.5	0.6	0.5	3.4*
PARTICIPATION AT CONFERENCES	3.5	0.9	1.6	0.3	0.6	1.6	2.5*
WORKSHOPS/SYMPOSIA	1.0	0.6	0.4	0.0	0.6	0.7	0.8
DIPLOMA THESES	1.2	0.9	0.7	0.5	1.3	0.5	1.0*
DOCTORAL THESES	1.2	0.9	1.1	0.8	0.7	0.6	1.1*
TENURE (HABILITATION)	0.2	0.0	0.2	0.0	0.2	0.1	0.2*
PRIZES & HONOURS	0.3	0.1	0.7	0.0	0.1	0.1	0.3*

Source: Survey; *ANOVA estimation results in significant differences between mean values for fields of science at a 5% significance level.

3.3.3 Popular Scientific Output & Media Representation

Apart from the traditional scientific means of publication the survey also asked about the “popular scientific” output of the research projects, such as published articles in newspapers, Internet publications, discussion meetings, presence in the media etc. Figure 14 illustrates the popular scientific output of FWF-funded research projects. As the survey did not ask for the number of publications, both completed and ongoing research projects are taken into account. The results are quite differ-

ent in comparison to the scientific output, which is highlighted by the fact that the *Natural Sciences* are below average and the *Humanities* are well above average in all items of this query.

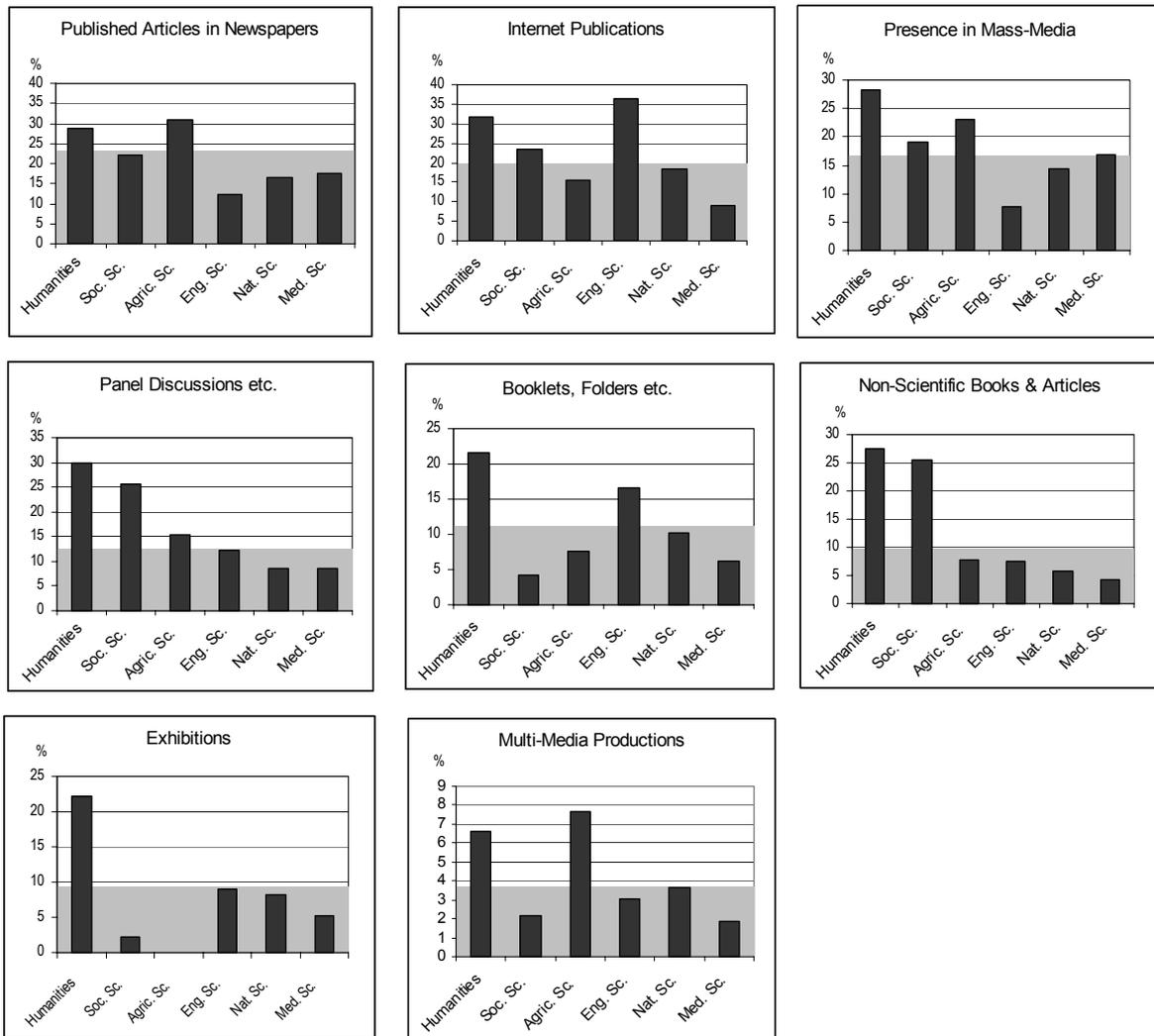
The most common means of popular scientific outputs are newspaper articles. Nearly a quarter of all projects resulted in the publication of at least one newspaper article. With 38 %, the *Agricultural Sciences* lead the field, followed by the *Humanities* (36 %) and the *Social Sciences* (28 %). The publication of non-scientific books and articles is quite common for projects in the *Humanities* (28 %) and the *Social Sciences* (26 %) whereas on average about 10 % of FWF-funded projects result in the publication of popular scientific books and articles.

Internet publications are most important for the *Engineering Sciences* (36 %), but also the *Humanities* (32 %) and the *Social Sciences* (23 %) are well above the average of 20 %, whereas only 9 % of projects in the *Medical Sciences* make use of Internet publications.

Projects in the *Humanities* (28 %) and the *Agricultural Sciences* (23 %) exhibit the highest rate of presence in the mass media. The *Natural Sciences* (14 %) and the *Engineering Sciences* (8 %) are well below the average of 17 %. The diffusion of knowledge via panel discussions/discussion meetings is used extensively in the *Humanities* (30 %) and the *Social Sciences* (26 %). Not really surprising, with a rate of 8 %, panel discussions are rather rare in the fields of *Natural Sciences* and the *Medical Sciences*.

About 12 % of FWF-funded projects involve the production of booklets and folders to illustrate the results of the research project. The *Humanities* (22 %) and the *Engineering Sciences* (17 %) are leading the field. Exhibitions and the production of movies and other multi-media productions are no ordinary means of output for research projects, although 22 % of the projects in the *Humanities* include the organisation of an exhibition.

Figure 14: Popular Scientific Output of FWF funded projects:



Source: Survey

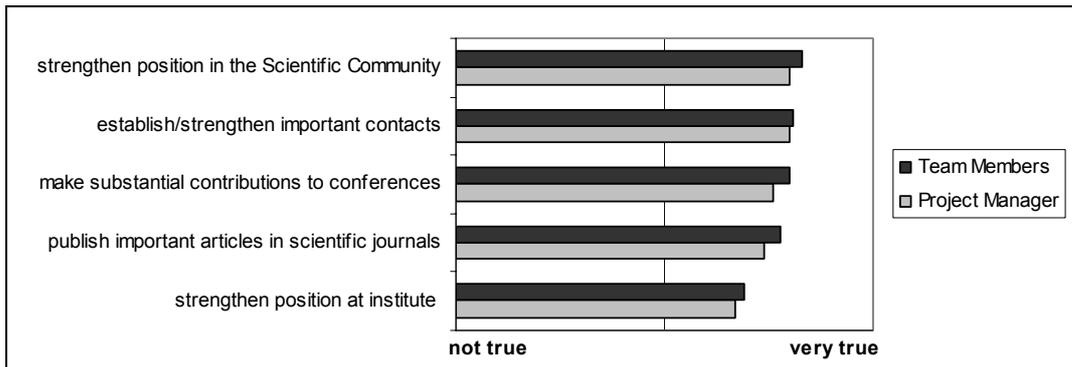
3.3.4 Impact of Projects

The perception of the impact of FWF-funded projects on the scientific career of project managers and team members is quite positive and does not vary strongly between the different fields of science. Figure 15 shows that even variations between project members and team members can be neglected, though the impact on team members is perceived a little higher in each case.

In the first place, FWF-funded projects help to strengthen the position of project managers and team members in the scientific community. Secondly, FWF-funded projects are used to establish or strengthen important contacts. The importance of substantial contributions to conferences and the publication of scientific articles in journals were already shown when looking at the scientific output of FWF-funded projects. Furthermore FWF-projects had no negative impact on the researcher's position at his or her institute.

In addition to the impact on the individual career of project managers and team members, the survey also asked about the potential impact of conducted research projects on society (see Figure 16). *Natural Sciences*, *Engineering Sciences* and the *Medical Sciences* were put in one group, as the results show that the perception of impact on society does not vary significantly between these groups.

Figure 15: Impact on Project Managers and Team Members

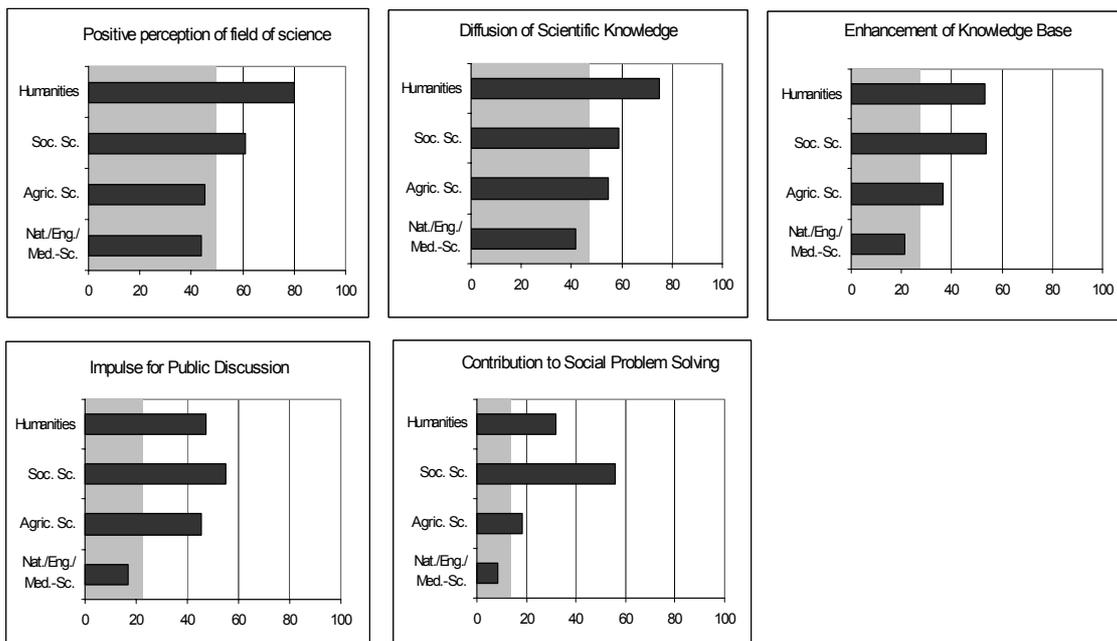


Source: Survey

In general, the *Humanities* and the *Social Sciences* look upon their projects' impact on society most favourably. 80 % of respondents in the *Humanities* and 60 % of the respondents in the *Social Sciences* report that the research projects contributed to a more positive perception of their field of science in society. About the same share reports that the research projects contributed to the diffusion (public understanding) of scientific knowledge and about 55 % state that the projects led to an important enhancement of the knowledge base in society. Furthermore, about 55 % projects in the *Social Sciences* give rise to impulses for public discussion and contribute to the process of social problem solving.

The *Natural Sciences* tend to have a somewhat different view, exhibiting below-average values in any of the 5 questions concerning the social impact of the accepted research projects. Nevertheless, 44 % of the respondents in the fields of *Natural Sc./Eng. Sc./Med. Sc.* replied that the research project contributes to a more positive perception of the field of science in public and 42 % are convinced that the project contributes to the diffusion (public understanding) of science and technology. However, the impact on the enhancement of knowledge base in society, as impulses for public discussion or as contribution to social problem solving, is estimated to be rather low.

Figure 16: Social Impact of FWF-funded projects



Source: Survey

3.4. COMMERCIAL OUTPUT & USABILITY

Besides scientific output, the questionnaire also asked about the commercial output of scientific projects (patents, spin-offs etc.) and the potential commercial usability of the research results.

First of all we asked about immediately realisable commercial results such as the number of prototypes, Spin-Offs etc. The total of FWF projects in the sample accounted for 43 national patents, 38 international patents, 153 prototypes, 32 registered designs (“Gebrauchsmuster”) and 5.5 Spin-Offs. Immediate commercial results evidently occur mainly in the *Engineering Sciences*, the *Medical Sciences* and the *Natural Sciences*.

Table 15: Commercial Results of Research Projects

	Nat. Sc. N~631	Eng. Sc. N~66	Med. Sc. N~212	Humanities N~167	Total
<i>National Patents:</i> 1	13	5	8	-	26
2	3	-	1	-	4
3	2	-	1	-	3
Total	25	5	13	-	43
<i>Int. Patents:</i> 1	19	-	6	1	26
2	3	-	1	-	4
4	-	-	1	-	1
Total	25	-	12	1	38
<i>Prototypes:</i> 1	18	10	3	-	31
2	8	1	3	-	12
3	1	-	-	-	1
5	1	-	-	-	1
90	-	1*	-	-	1
Total	42	102	9	-	153
<i>Gebrauchsmuster:</i> 1	5	-	1	2	8
2	1	-	-	-	1
5	1	-	-	-	1
7	1	-	-	-	1
10	1	-	-	-	1
Total	29	-	1	2	32
<i>Spin-Offs:</i> 0.5	-	1	-	-	1
1	2	1	2	-	5
Total	2	1.5	2	-	5.5

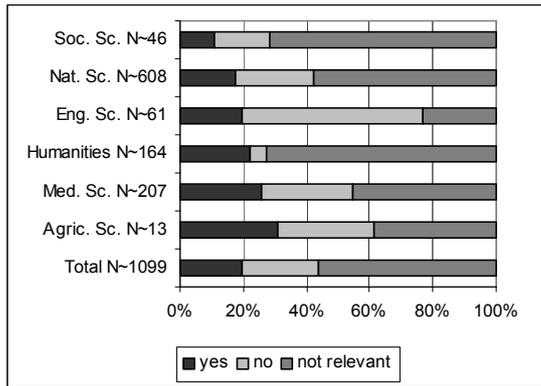
* 90 electronic chips

Source: Survey

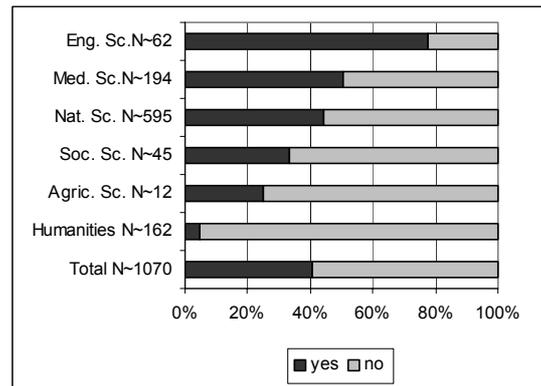
In addition we asked the project managers whether the research results had any relevance for industry or not. The result is somewhat surprising, as on average about 41 % of the respondents regard the results of the research projects as relevant for industry (Figure 17). At about 80 % this value is highest for the *Engineering Sciences*, followed by the *Medical Sciences* (50 %) and the *Natural Sciences* (45 %). Even in the *Social Sciences* and the *Agricultural Sciences*, a third and a quarter respectively consider the research results as relevant for industry.

Though the relevance of research results for industry is rated relatively high, researchers apparently do not see the need, or do not have the possibilities to forge links with industry. Figure 17 shows the realisation of contacts with industry. The *Agricultural Sciences* and the *Medical Sciences* seem to have the strongest links. Even though the *Engineering Sciences* report the highest relevance for industry, there seems to be some deficiency in realisation of contacts.

Figure 17: Realisation of Contacts



Relevance for Industry

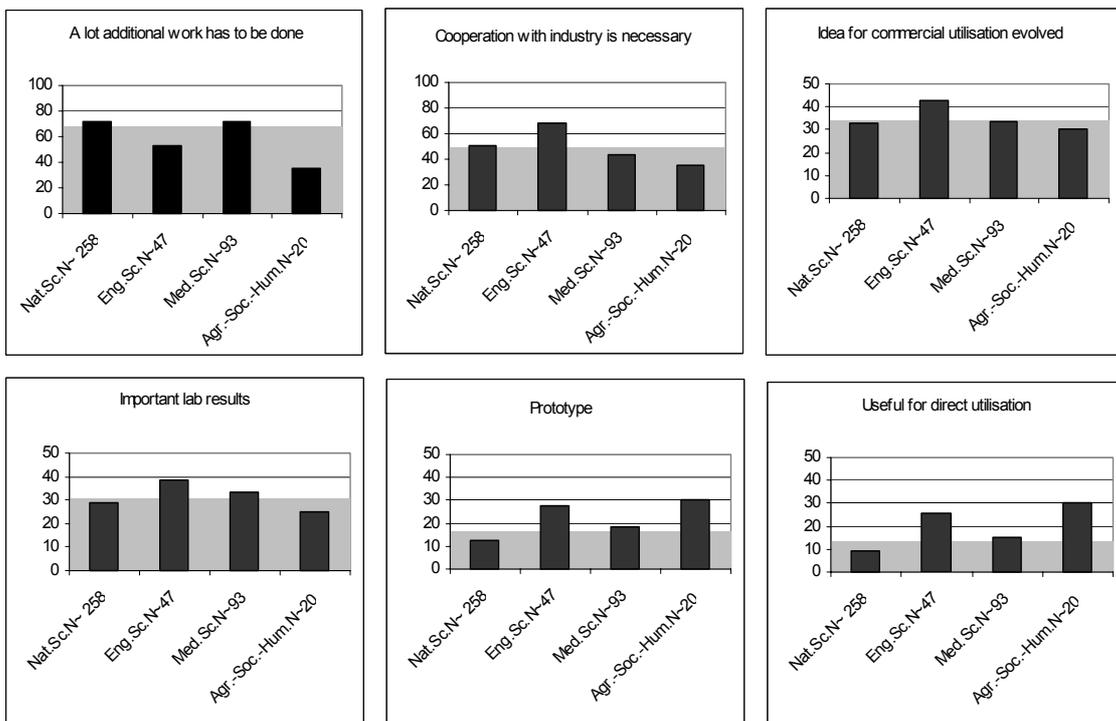


Source: Survey

We further asked about the commercial usability of the research results which are considered to be of certain relevance for industry (Figure 18). In about 30 % of the research projects an idea for commercialisation evolved, but in about 50-60 % of the projects (apart from the *Agricultural Sciences*) a lot of additional development work would have to be conducted in order to commercialise the results of the research projects. About 45 % of the research projects consider a co-operation with industry as necessary in order to commercialise the results.

About 30 % of the results include important lab results and in about 20 % of the research projects working prototypes exist. On average, 13 % of the research results are suitable for commercialisation straight away; although in the *Engineering Sciences* direct commercialisation is possible in almost 25 % of the cases, and in the *Social Sciences, Humanities & Agricultural Sciences* 30 % of the research results which are considered to be relevant for industry are suitable for direct commercialisation.

Figure 18: Commercial Usability of Research Results



Source: Survey

3.4.1 Follow-up projects

Finally we asked whether follow-up projects for the completed FWF-funded projects exist. Out of the 392 completed projects in the sample 245 (62.5%) project managers planned a follow-up project. The majority, some 72% of the projects, applied for new funding to the FWF whereas 14% applied to other national institutions and 15% to international institutions. 7% did not request subsidies for the follow-up project (questionnaire allowed for multiple answers).

4 Main findings

The FWF has an eminent relevance for the University system in Austria. Not only 85 % of the applications are submitted by coordinators which are affiliated with an Austrian University; but on average Austrian institutes rely on the FWF for more than one third (34.2 %) of their total external funding. A more disaggregate analysis shows that for some faculties (like the *Natural Science* or *Humanities*) the FWF's share is more than half of the total external funding.

However, the share of external funding (i.e. funds other than the *General University Funds, GUF*) is rather low in Austria: although somewhat diminishing, *GUF* still represents more than 80 % of Higher Education R&D. Adding other external funding from public sources raises the 'public share' to 95 % - a higher share than in any OECD-country bar Slovakia.

The present study restricted the analysis to the 'project-based programmes', thus scientific projects, special research programmes and joint research programmes which covers 83 % of the total amount (or nearly 90 % of the regular FWF budget) granted by the FWF. The average approval rate within these areas is 51 % whereby projects in the Natural Science and the Humanities find the highest acceptance rate (close to 58 %) and within Agricultural and Social Sciences only about one third of their applications receive funding (35 and 34 %, resp.). Moneywise, the approval rates are on average 41 % and thus lower than for the number of applications.

Beside the scientific 'quality' of a research proposal which is to be assessed by external peers, there are other dimensions (like all information asked on the application formula for funding of a research project) which could play a role for funding decision. Aiming at identifying parameters which influence the FWF's decision on whether to accept or reject a certain proposal the analysis shows that there seems to be no types of projects which are either 'natural losers' or 'natural winners'. Different submitted proposals find a 'level' playing field in relation to the probability of acceptance.

Concerning the major aspect of scientific output, i.e. publications, FWF funding bears positively on all types of publications (SCI-publications, monographs, etc.). This implies a quite strong 'efficiency of funding'.

The results of the survey show that the majority of customers of the FWF rate their research unit among internationally leading edge units and see their FWF-projects as a main contribution to an advance in knowledge in their scientific discipline. The building up of international co operations is, beside the promotion of young researchers and publications, highly ranked in the assessments of the projects by the customers.

FWF projects are used more often to extend already existing main research activities and less to establish new main research activities at the research unit. Thus the submission of FWF projects is based on already existing strengths and research foci and is used in order to strengthen specific but already existing research orientations.

Asked for the subjective assessment of the ex-ante evaluation of the proposals the answers of the coordinators of the rejected proposals shows quite clear: the overwhelming part of the submitters (53 %) blames to some extent the 'incompetence' of the reviewers. Only a minor part of 8 % mentioned the FWF itself in their explanation (FWF as a 'closed club').

The results of the survey further shows that 52 % of the rejected proposals were not carried out. The other part (48 %) of the coordinators reported that the projects were carried out either as planned or slightly modified; 45 % of them financed by internal and 36 % by other resources.

Out of the accepted projects 87 % have at least one research partner and 70 % had at least two partners and some 13 % reported five research partners. The distribution of the countries of origin does not vary a lot among the research partners but reflects a high degree of internationality. About 50 % of the research partners in FWF projects are from Western-Europe countries and 15 % are from the USA. 7-8 % are from CEECs and 15-20 % represent national co operations. With 40 % the multidisciplinary of the first research partner tends also to be quite high.

There was a high overall satisfaction rate with the results of the completed projects: 81 % of the respondents replied that the results of the project met initial targets. 19 % of the respondents replied that the results of the project fulfilled the original intention at least in part.

The average scientific output of the completed FWF-funded projects can be summarized as follows: on average FWF funded projects yields 4.6 publications in peer-reviewed journals, 1.2 publications in non-peer reviewed journals, 0.9 scientific reports among others. It is self-evident that the mean values differ significantly between fields of science. Apart from the traditional scientific output FWF projects exhibit a range of 'popular scientific' output, i.e. newspaper articles, internet publications, etc.

The perception of the impact of FWF funded projects on the scientific career of project coordinators and team members is quite positive and helps to strengthen their position in the scientific community and are used to establish important contacts.

Concerning the commercial relevance of the FWF projects the survey give a somewhat surprising result: about 40 % of the respondents regard the results of the research projects as relevant for industry. Though the relevance of research results for industry is rate relatively high, researchers apparently do not see the need, or do not have the possibilities to forge links with industry.

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