Who prefers the 'cost-effectiveness ratio' prioritization approach in health-care decisions? Results of an empirical analysis

Kathrin Damm Dipl.-Ök.,* Anne Prenzler Dr. rer. pol† and Andy Zuchandke Dipl.-Vw.‡

*Research Assistant, †Lead Researcher, Leibniz University Hannover, Center for Health Economics Research Hannover (CHERH), Hannover Germany and ‡Research Assistant, Leibniz University Hannover, Center for Risk and Insurance, Hannover Germany

Correspondence

Kathrin Damm Dipl.-Ök.
Leibniz University Hannover
Center for Health Economics Research
Hannover (CHERH)
Königsworther Platz 1
Hannover 30167
Germany
E-mail: kd@ivbl.uni-hannover.de

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Abstract

Background The problem of resource scarcity has led to an on-going debate about priority setting in the health-care system. Prioritization via the economic-based cost-effectiveness ratio (CER), for example, is controversial and has many advocates as well as opponents. Hence, the aim of our research is to analyse the fairness consideration of the CER approach in comparison with other prioritization approaches and to investigate whether these preferences depend on the field of study.

Methods We developed and tested a unique questionnaire. Between October 2011 and January 2012, freshmen and advanced university students of medicine, law, economics, philosophy and religion in Germany were asked to choose among four prioritization approaches (CER, minimum health, random selection and age) using a dichotomous choice technique. The data were analysed by descriptive and microeconomic regression techniques.

Results Data on 913 students were included in the study. A majority of the students prioritized cost-effectiveness second after minimum health. Advanced economics students preferred the CER approach significantly more than did incoming economics students. The attitudes of the advanced philosophy/religion students towards the CER were significantly more negative compared with the respective freshmen. Further, gender had a strong, significant impact on attitudes: women chose the CER less often than men did ($P < 0.01$).

Conclusion The results of this study indicate that attitudes presented by opinion leaders in the investigated fields of study seem to be in line with the perceptions of the respective fields' advanced students. Because of these differences, the debate on how to deal with scarce resources may remain complicated.

Background

The problem of scarce resources has led to an on-going debate about priority setting in health-care systems, mainly among representatives of the academic disciplines of medicine, economics, law, philosophy and religion.^{1,2} An interdisciplinary consensus seems difficult to achieve because of differing views on how an equitable system of prioritization should be designed.^{3,4}

In the literature, there exist several prioritization approaches resulting from different principles of justice. For instance, the 'minimum health' approach prioritizes patients with the worst health and highest need.^{5,6} This approach is, for example, in line with the opinion of the German Medical Association that patients' conditions and needs are the main prioritization criteria (as these correspond closely to the Hippocratic Oath, which is taken by physicians and health-care professionals).⁷ Much discussed in the literature is priority setting or rationing by age, an egalitarian approach with different interpretations. One well-known approach has the objective of providing every person the opportunity to live in good health for a normal period.⁸ A different rather hypothetical egalitarian approach that entails absolute equality of chances but has yet not found a way into practical priority setting is 'random selection' via lottery.⁹

Another controversial approach is that of the cost-effectiveness ratio, an instrument of utilitarian benefit maximization, which has both strong advocates and opponents. Its advocates argue that it is the only criterion that considers resource scarcity. The cost-effectiveness ratio approach offers transparency with respect to the additional costs and benefits of different health-care intervention in comparison. Accordingly, the incremental cost-effectiveness ratio is an important outcome in health economic evaluations (e.g., in cost-utility analyses [CUA]).¹⁰ However, there also exist many opponents of this prioritization approach, particularly researchers with academic backgrounds different than economics.

With exceptions^{11,12}, prominent researchers with philosophical or legal backgrounds have argued that CUA led to discrimination against individuals (older or sicker patients and expensive or rare indications) and counteract the principle of equal opportunity and access to health care.^{13–15} Those researchers especially argued against the use of the quality-adjusted life years (QALY) concept in reimbursement decisions, which considers the remaining years of life and the corresponding health-related quality of life in assessing the value of a health-care technology or service.¹⁶ They indicate that consequentialist approaches in general cannot fulfil the principle of equality between citizens.

The question is whether members of the mentioned academic disciplines generally share specific judgments and whether their educational background determines their opinions. Different methods and theories taught at universities in different fields of study may encourage the formation of varying opinions on the distribution of health-care resources. Therefore, it is interesting to explore whether opinions change during the course of study and whether freshmen already have preliminary attitudes. As the concept of the cost-effectiveness ratio is associated with economic theory (and teaching), we assume that advanced economics students view this prioritization approach as fairer in comparison with incoming economics students or advanced students in any other field of study, while, for example, advanced medical students view need-based approaches as fairer, and philosophical or legal students rather tend towards other egalitarian approaches.

Hence, the aim of our research is to analyse fairness considerations of the cost-effectiveness ratio approach in comparison with other prioritization approaches in general and to investigate whether attitudes towards this approach differ systematically between the academic disciplines involved in the discourse on prioritization.

Therefore, we developed and tested a unique questionnaire and asked freshmen and advanced students of medicine, law, economics,

philosophy and religion to prioritize the four above-mentioned priority approaches (minimum health, random selection, age and cost-effectiveness ratio) regarding their fairness within a hypothetical, abstract scenario.

First, the results are presented descriptively to analyse the relative importance of the cost-effectiveness ratio approach in comparison with the other approaches. Second, a microeconomic regression technique is used to explore whether attitudes towards this prioritization approach differ systematically between the academic disciplines. Several control variables were included in the regression.

Methods

We asked students of law, economics, philosophy and religion at the University of Hannover (LUH), Germany, and medical students at Hannover Medical School (MHH), Germany, to fill out a questionnaire specifically designed for this study. More precisely, the questionnaire was first developed after reviewing and discussing respective literature for standard approaches in this field of research. In the second stage, we discussed the design as well as the specific questioning technique at the faculty of economics at the University of Hannover (LUH) and conducted a pretest in September 2011, including 20 students in total of different academic disciplines. After filling out the questionnaire, the students were asked to report (face-to-face) inconsistencies and understanding problems and also mark them directly in the questionnaire. The results of the pretest were used for revising the questionnaire.

To enlarge the group of philosophy and religion students, we also included students at the University of Goettingen. Freshmen were mainly interviewed during their respective 'study orientation week' at the beginning of their first term. Furthermore, we collected data from advanced students, as the length of study might influence their attitudes. Questionnaires were filled out anonymously during lectures. The main study was conducted between October 2011 and January 2012. Approval was

obtained from the Committee for Clinical Ethics at Hannover Medical School (MHH).

To keep the survey as simple as possible and to create a situation of scarcity for the participants, we set the following scenario:

In one room, there are several persons of different ages. All of them need treatment, but some are more severely ill than the others. Imagine that there are not enough staff, time, and money available to treat all patients.

We combined four different prioritization approaches to six choice sets, each consisting of two approaches. For each set, participants were asked to choose the approach that they considered as fairer. The four approaches were as follows:

1. A lottery will decide the order in which the treatment takes place. Everyone has an equal chance.
2. The person who currently has the worst health status will be treated first, then the person with the second worst health status, and so on.
3. The youngest person is treated first, then the second youngest, and so on.
4. The person whose treatment generates the maximum benefit (treatment success, quality of life, etc.) in relation to the treatment costs is treated first, then the person whose treatment generates the second best ratio, and so on.

Figure 1 shows an example of one of our six choice sets.

For data entry, we counted the number of votes. Each approach was evaluated indirectly from 0 (least fair) to 3 (most fair). Response '3' meant that the respective approach dominated all other approaches in a direct comparison, whereas '0' meant that the approach was never chosen in a direct comparison. Hence, we constructed an ordinal variable for each approach (number of choices for the cost-effectiveness ratio approach, random selection approach, minimum health and age criterion). To ensure the appropriateness of the ordinal structure, we included only students with transitive answers.

Figure 1 Example of a choice set.

The questionnaire also included information on academic discipline and number of study terms (a term ['semester'] in Germany lasts half a year). Because of the small number of students studying philosophy and religion and because most students took classes in both subjects (as major and minor), we assigned the responses of these students into one group. Hence, the possible subjects of 'medicine', 'law', 'economics' and 'philosophy/religion' were coded as dummy variables. Furthermore, we included the variable 'term', the number of study terms already completed. Therefore, freshmen have the study term '0'. Finally, we created interaction variables (term $\times$ academic discipline) to identify the effect of the variable 'term' for all academic disciplines separately.

We also asked the students to give us information on their health status and socio-economic background, which we included as control variables in our regressions. Besides gender, nationality and having children, additional binary variables indicated the existence or non-existence of chronic disease and the presence of a serious illness among friends or family members. In addition, the type of health insurance indicated whether the respondents were insured under statutory health insurance (SHI) or under private health insurance. We included two more control variables regarding individual health status and health-conscious living, both requested by a 5-point Likert scale. We used parental education years as a proxy for the respondents' social background. Therefore, the highest parental educational level, which we requested in the questionnaire, was recoded into the number of typically completed

schooling or training years. Finally, we included age as a control variable.

To evaluate whether attitudes towards the cost-effectiveness ratio approach differ between fields of study, we considered the following initial equation:

$$y_i^* = \beta_0 + \beta_1 \cdot \text{term}_i + \gamma' \cdot M_i + \phi' \cdot \text{term}_i \cdot M_i + \mu' \cdot X_i + \varepsilon_i$$

y_i^* represents the non-observable continuous variable for attitudes towards the cost-effectiveness ratio approach.

The variable 'term_{*i*}' indicates the number of finished study terms, and the vector M_i includes the dummy variables for the different disciplines of philosophy/religion, law and medicine. The variable for the academic discipline of economics is considered as the reference category. The vector X_i includes all control variables. Furthermore, ε_i is the idiosyncratic error term, which we assumed to be normally distributed. The product of the variable 'term_{*i*}' and the vector M_i represents the already-mentioned interaction terms. As a consequence of including the interaction terms, the coefficient β_1 only represents the effects of the terms on the respective basis variables (economics). The influences of the other disciplines are covered by those interaction effects.

Because of the ordinal structure of our dependent variable, we made use of an ordered probit regression based on a latent variable approach. The probit specification was used because of our assumption of a normally distributed idiosyncratic error term. Detailed

descriptions of the ordered probit model and the latent variable approach are provided in Winkelmann and Boes and in Wooldridge.^{17,18}

Data entry, clean-up and analysis were performed with the software packages SPSS (version 19; IBM, Armonk, NY, USA) and Stata (version 11; Stata Corp., College Station, TX, USA).

Results

In total, 1221 students participated in the survey. Because of missing data, 233 responses were excluded from the regression. Furthermore, we excluded participants who provided non-transitive answers ($n = 75$) because of the impossibility of determining the order of their preferences and the difficulty of interpreting such answers. However, we checked whether these students had special characteristics; nonetheless, we did not find any significant between-group differences.

Finally, we included 913 students (30, 31, 31 and 8% medical, law, economics and philosophy/religion students, respectively). Across the four groups, the percentage of freshmen was 60–64%. In our study, advanced students finished an average of 4.6 (± 2.2) study terms. Table 1 shows further participant characteristics.

First, we present descriptive results regarding the students' attitudes towards prioritization approaches and the relative importance of the cost-effectiveness ratio.

Descriptive analyses

Of all 24 possible transitive rankings, 19 were chosen by the participants. Almost one-third chose the combination of 'minimum health >

Table 1 Characteristics of participant sample

	No. (%)
Academic discipline	
Medicine	269 (29.5)
Law	286 (31.0)
Economics	283 (31.3)
Philosophy/Religion	75 (8.2)
Women	542 (59.4)
Non-German nationality	42 (4.6)
Having children	26 (2.8)
Private health insurance	170 (18.6)
Chronic disease	127 (13.9)
Serious illness among family or friends	318 (34.8)
Subjective health status	
(Rather) bad	35 (3.8)
Neutral	70 (7.7)
(Rather) good	808 (88.5)
Subjective health-consciousness	
(Rather) no	112 (12.3)
Neutral	155 (17.0)
(Rather) yes	646 (70.8)
	Mean (SE)
Finished study terms* (standard error)	1.64 (2.576)
Parental education years (standard error)	14.72 (4.042)
Age (standard error)	22.47 (2.749)

*Starting with 0 for the first term.
SE, standard error.

cost-effectiveness ratio > random selection > age'. Table 2 shows the five most chosen combinations.

Among all 913 students, it is apparent that the 'minimum health' standard was prioritized highest in all five of the most selected combinations. This is also the case when the academic disciplines are investigated separately. However, among the top five combinations of advanced economics students, in one combination, the criterion 'cost-effectiveness ratio' is prioritized first.

Table 2 Descriptive results: the five most chosen combinations of priority setting approaches

	1st Place	2nd Place	3rd Place	4th Place
31.2%	Minimum health	Cost-effectiveness	Random selection	Age criterion
19.7%	Minimum health	Cost-effectiveness	Age criterion	Random selection
15.5%	Minimum health	Random selection	Cost-effectiveness	Age criterion
6.8%	Minimum health	Age criterion	Cost-effectiveness	Random selection
6.5%	Minimum health	Random selection	Age criterion	Cost-effectiveness
79.7%				

Table 3 presents more detailed results and shows how often the four approaches were chosen. The results are divided according to field of study as well as the freshmen and advanced students' groups.

The cost-effectiveness ratio was prioritized second highest in 50% of all participants. Looking at advanced students, prioritization of this approach is lower among medical and philosophy/religion students compared with the respective freshmen. Advanced economics students chose this approach more often than economics freshmen, while the average ranking of the law students is nearly the same among the advanced and freshmen groups. Interestingly, the average prioritization of the cost-effectiveness ratio among freshmen studying economics is the lowest among freshmen in any investigated field; on the other hand, the average prioritization of the cost-effectiveness approach among advanced economics students is higher than that among any other group. Overall, the lowest prioritization of the cost-effectiveness ratio was found in advanced philosophy/religion students.

Before analysing attitudes towards the 'cost-effectiveness ratio' approach via a detailed regression analysis, we briefly describe the further results.

The minimum health approach was prioritized highest by more than 79% of the participants in each group; therefore, this was seen as the most important approach. The results on average rank show that advanced students of medicine (90.4%), philosophy/religion (90.6%) and law (90.5%) chose this approach more often than did the respective freshmen (81.7, 83.7 and 79.6%). The opposite is shown among the economists (freshmen 86.2%, advanced 80.7%). The overall highest prioritization of the minimum health approach was found among the advanced philosophy/religion students.

The age criterion was considered as the least fair approach by the majority of respondents. More than 50% of the respondents assigned it the lowest priority. The average values show few differences between freshmen and

advanced students of the different academic disciplines.

With regard to the random selection approach, the variation of the number of choices was the highest in this approach in comparison with all other approaches. This indicates that the random selection criterion did not have a clear rank with regard to the number of choices. The average value assigned by freshmen studying economics (1.01) was (slightly) higher in comparison with all other freshmen (medicine: 0.91, philosophy/religion: 0.86 and law: 0.99), while the average of the advanced philosophy/religion students was higher than that of any other group. The averages also show that only advanced students of philosophy/religion chose this approach more often than the freshmen.

Regression results

The results of the regression model are presented in Table 4.

The table shows that the regression coefficients of the academic disciplines have positive signs, which indicates that the non-economics freshmen preferred the cost-effectiveness ratio more than the economics freshmen. However, none of these variables is significant. Therefore, the results show no significant differences in the respective attitudes of freshmen towards the 'cost-effectiveness ratio' criterion.

The study term variable was positive and significant ($P < 0.05$), which indicates that advanced economics students preferred the cost-effectiveness ratio more in comparison with incoming economics students. The results for the interaction variables are in line with the descriptive results. All interaction variables are negative, which means that the attitudes of the advanced economics students increased more (or, more specifically, showed the highest positive difference between the freshmen and advanced students) in comparison with the non-economics students.

The coefficients of the philosophy/religion and medical students are significant, indicating that their preferences ran contrary to those of

Table 3 Descriptive results: overview of the number of choices differentiated by field of study

	Number of choices	Overall (%)		Economics (%)		Medicine (%)		Philosophy/Religion (%)		Law (%)	
		(n = 913)		Freshmen (n = 174)	Advanced (n = 109)	Freshmen (n = 186)	Advanced (n = 83)	Freshmen (n = 43)	Advanced (n = 32)	Freshmen (n = 181)	Advanced (n = 105)
Cost-effectiveness	3	12.6		11.5	13.8	16.7	8.4	14.0	6.2	14.9	6.7
	2	52.2		51.1	59.6	47.8	54.2	53.5	37.5	49.2	61.9
	1	24.1		25.3	21.1	23.1	26.5	18.6	40.6	23.2	23.8
	0	11.1		12.1	5.5	12.4	10.8	14.0	15.6	12.7	7.6
	Average	1.66		1.62	1.82	1.69	1.60	1.67	1.34	1.66	1.68
Minimum health	3	86.2		86.2	80.7	81.7	90.4	83.7	90.6	79.6	90.5
	2	9.2		9.2	11.9	14.5	6.0	9.3	9.4	14.4	4.8
	1	3.4		3.4	7.3	2.7	2.4	7.0	0.0	5.5	4.8
	0	1.1		1.1	0.0	1.1	1.2	0.0	0.0	0.6	0.0
	Average	2.79		2.80	2.73	2.77	2.86	2.77	2.91	2.73	2.86
Random selection	3	2.0		1.7	3.7	1.1	0.0	2.3	3.1	2.8	1.9
	2	23.5		27.6	15.6	24.2	27.7	20.9	31.2	23.2	20.0
	1	41.0		40.8	50.5	39.8	31.3	37.2	43.8	44.2	36.2
	0	33.5		29.9	30.3	34.9	41.0	39.5	21.9	29.8	41.9
	Average	0.94		1.01	0.93	0.91	0.87	0.86	1.16	0.99	0.82
Age criterion	3	1.1		0.6	1.8	0.5	1.2	0.0	0.0	2.2	1.0
	2	13.5		12.1	12.8	13.4	12.0	16.3	21.9	13.8	13.3
	1	30.8		30.5	21.1	34.4	39.8	37.2	15.6	27.6	35.2
	0	54.7		56.9	64.2	51.6	47.0	46.5	62.5	56.4	50.5
	Average	0.61		0.56	0.52	0.63	0.67	0.70	0.59	0.62	0.65

Table 4 Regression results

Variable	Coefficient (standard error)
Study term	0.063* (0.028)
Academic discipline (base category: economics)	
Medicine	0.131 (0.119)
Law	0.071 (0.112)
Philosophy/Religion	0.162 (0.171)
Study term × Academic Discipline (base category: Study term × Economics)	
Study term × Medicine	−0.070* (0.034)
Study term × Law	−0.015 (0.041)
Study term × Philosophy/Religion	−0.150† (0.046)
Gender (base category: male)	−0.325† (0.077)
Number of observations	913
Nagelkerke R^2	0.042

Non-significant control variables: age, nationality, children, type of health insurance, chronic disease, serious illness among family or friends, subjective health status, subjective health-consciousness and parental education years.

Significance levels denoted by *5%, †1%.

the economics students. Shifting the reference category successively shows that the attitudes of the advanced law and medicine students were not significantly different to the respective freshmen. Advanced philosophy/religion students, however, preferred the cost-effectiveness ratio significantly less compared with incoming ones ($P < 0.05$).

Despite these results, it cannot be argued that advanced economics students prefer the cost-effectiveness ratio more in general than did non-economics students. The initial positive coefficients of the non-economics students indicate that the difference between the economics and non-economics students diminishes with the number of completed study terms until the preference of the economics students exceeds that of the other students.

To illustrate the differences between the fields of study, Figure 2 shows the predicted probabilities of a (hypothetical) reference person choosing the cost-effectiveness ratio once (top left) or twice (bottom left), depending on the number of finished study terms (0–10), for each field of study. The reference person is characterized by the average values of the continuous variables as well as the choice with the highest proportion in the cases of the dummy

variables (female, SHI, no children, no illness, etc.). The graphs presented at the top right and bottom right show the corresponding 95% confidence intervals.

The figures demonstrate that the predicted probability of choosing the cost-effectiveness ratio once (top left) decreases with each subsequent term in the case of economics and law students, while the probability of choosing the criterion twice increases. The probabilities of the economics and law students develop similarly in both cases (and vice versa, for religion/philosophy students). Supplementary to our regression results, the graphs demonstrate that after finishing the second term, the difference between the economics and philosophy/religion students increases with the number of study terms completed. The figures also show that in the case of medical students, the probabilities remain virtually unchanged, so that the significant differences between them and the economics or philosophy/religion students arise because of the increasing or decreasing attitudes of those two groups. Looking at the confidence intervals, the graphs show significant differences, especially between the economics and philosophy/religion students. The differences between economics and philosophy/religion students in terms of choosing the criterion once (twice) become significant after finishing the fifth (second) semester.

Besides field of study, the regression results (Table 4) indicate that gender has a highly significant impact on attitudes towards the cost-effectiveness ratio approach ($P < 0.01$). In comparison with male students, female students have a lower preference for the cost-benefit ratio.

Discussion

The analyses show that attitudes towards the cost-effectiveness ratio prioritization approach differ partially between academic disciplines. We found no significant differences between freshmen. Thereby, the coefficients indicate that economics freshmen are more sceptical about the cost-effectiveness ratio approach than are

Figure 2 Predicted probabilities and corresponding confidence intervals of a reference person choosing the 'cost-effectiveness ratio' criterion once or twice depending on the number of finished study terms for each field of study. Description: top left: predicted probabilities of a reference person (female, SHI, no children, no illness, etc.) choosing the 'cost-effectiveness ratio' criterion once depending on the number of finished study terms (0–10) for each field of study; top right: corresponding 95% confidence intervals; bottom left: predicted probabilities of choosing the criterion twice; bottom right: corresponding 95% confidence intervals.

other students. We found no significant differences in attitudes towards the cost-effectiveness ratio approach between the medical freshmen and the advanced medical students; the same result held for law students. However, as expected, advanced economics students preferred the cost-effectiveness ratio more in comparison with incoming economics students, while advanced philosophy/religion students preferred the approach less than the respective freshmen. Because of these preference structures, significant differences appeared between the academic disciplines. The present debate between health economists and philosophers in Germany and internationally on the use of CUA for prioritization is reflected in our

results.^{19–21} We therefore assume that there are systematic differences between these two academic disciplines – and not only between individual opinion leaders – that increase during university studies.

Our analyses focused on preferences towards the cost-effectiveness ratio of the many advocates and opponents of this approach and the resulting controversial discussion in the scientific community. However, results of the attitudes towards the other prioritization approaches, which were used for comparison, are also interesting to discuss. It is apparent that the majority of the students, independent of field of study, rated the minimum health approach as the most equitable. Furthermore,

the prioritization of this approach is even higher among the advanced students than the freshmen, except for the group of economics students. This finding is in line with that of Ahlert, Schwettmann, and Funke and Ahlert, Felder, and Vogt, who conducted experiments on the distribution of health-care resources among students.^{22,23} They also found differences in the distribution of behaviour between academic disciplines: economists tended to maximize the pay-off, whereas the physicians' choices were more in line with maximizing the number of recipients and with Rawlsianism.

In contrast to the minimum health criterion, the age criterion was the least chosen option. More than 50% of the participants did not choose the age approach once in the direct comparisons. This finding supports the critical voices in the literature.^{9,20,24} Perhaps this criterion is considered to be relatively unfair because it is not disease specific but person related, and therefore, discriminatory.²⁵ The opinion with respect to the random selection approach was more heterogeneous. Of the students, 23, 41 and 33% ranked the criterion in second, third and fourth places, respectively. However, further research is needed to determine who prefers the random selection approach.

Even though some authors found no significant influence of gender on the distribution of health-care resources by students in various fields of study, our results indicate a strong gender-based influence.²² Female students were less likely to prefer the cost-benefit ratio than male. Additional analyses showed that they instead had a higher preference for the random selection approach. Further research on this aspect is highly recommended.

The objective of our study was to determine whether attitudes towards prioritization approaches – with a focus on the cost-effectiveness ratio approach – depend on the field of study. To generate a relatively large sample, we tried to reduce the complexity of the questionnaire. Therefore, we limited our survey to a few approaches, which we formulated and presented as simply as possible (see Fig. 1).

Accordingly, the list of approaches used in this study is not exhaustive. More detailed overviews can be found in Cookson and Dolan or Marckmann *et al.*^{26,27} Additionally, we asked the participants which approaches they were considering as fairer. As cost-effectiveness is inherently an efficiency criterion, the question itself might have biased the choices.

The simplicity mentioned above also applies to the hypothetical scenario illustrated in the questionnaire introduction. Here, aspects can be criticized as unrealistic. However, we aimed to identify potential attitude differences between the fields of study. We believe that simple situations and simple response options are more purposeful for such analysis.

Ordered probit and ordered logit models are often used in applied econometric analyses. Nevertheless, the models have some limitations, especially in terms of analysing marginal effects. First, the assumption of a normal or logistic distribution means that the sign of the coefficients does not necessarily represent the direction of the effect for all outcomes of the dependent ordinal variable.¹⁸ Moreover, assumptions like the single index function or constant thresholds lead to further restrictions. A detailed overview of limitations based on ordered response models is provided in Boes and Winkelmann.²⁸

A further limitation might result from the lack of independence between the cost-effectiveness ratio variable and the attitudes towards the other approaches, as the rankings of the criteria depend on each other. However, as we used only cross-sectional data, the problem of interdependency is assumed to be very small. Nevertheless, because we cannot control for this possible effect, it should still be borne in mind when interpreting the results.

With respect to the respondents, all students studied in Hannover or Goettingen. It is possible that students in the southern and eastern regions of Germany have different perceptions. Furthermore, it is possible that advanced students have been influenced by the opinions of single professors at these universities. However, as the lectures are given by various professors,

the possibility of a special influence is minor. Nevertheless, a wider study would also have the advantage that more students who study philosophy and religion could be integrated into the data set. Owing to the small number of students, we formed one group of these subjects, which is also a restriction.

The results and implications of this study are also limited to Germany. Students being trained in these academic disciplines in other countries might have different views on prioritization, for example, because of a different situation (like health-care structure) or attitude in the country of origin.

As mentioned above, we used cross-sectional instead of longitudinal data. We did not analyse the perceptions of the same study group over time. Besides the mentioned possibility of controlling for interpersonal heterogeneity, another important issue is school dropout rate. These may be especially relevant for law and economics, as the dropout rate in those fields can be up to 50%. Hence, it would be interesting to conduct the same study again and to interview the same group over time.

Finally, we only represented quantitative data – a further limitation of this study. Our dependent variable has a sheer subjective character, which can lead to heterogeneous interpretations and answering behaviours. We do not know why the participating students answered that way. However, we can describe certain tendencies in the responses; especially, as we have found significant differences in the current study, we identified further need for research to investigate the response behaviour using a mixed-method approach.

Conclusions

To our knowledge, this is the first study to analyse the relative importance of the 'cost-effectiveness ratio' prioritization approach and the impact of field of study on attitudes, using a dichotomous choice technique. The majority of the students prioritized this approach second after the minimum health criterion. However, the results showed systematic

differences between the fields of study, which mainly develop during the course of study. Especially, advanced economics students preferred the cost-effectiveness ratio more compared with incoming economics students, while advanced philosophy/religion students preferred the approach less than the respective freshmen. Because of these preference structures, significant differences appeared between the two academic disciplines. In conclusion, the attitudes presented by opinion leaders in particular fields of study seem to be in line with the perceptions of advanced students in those fields. Because of these differences, the debate on how to deal with scarce resources may remain complicated.

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Conflict of interest

The authors declare no conflict of interest.

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