

Szent István University
Gödöllő
PhD School of Management and Business Administration

Theses of Doctoral (PhD) Dissertation

**SELECTION, COMPETITION, AND RISK IN THE PROCESS OF ECONOMIC
EVOLUTION**

-

**THE STUDY OF UNCERTAINTY AND RISK ASSUMPTION AMONG HIGHER
EDUCATION STUDENTS**

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2017

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Contents

1	Background and objectives	4
1.1	Topicality and importance.....	4
1.2	Study objectives	7
2	Materials and methods	8
2.1	Test topics (TT) and hypotheses (H)	8
2.2	Test layout	9
3	Results	11
3.1	Two-dimensional group analysis	11
3.2	Three-dimensional group analysis.....	12
3.3	Analysis of TT1: Characteristics of students avoiding selection/competition and exercising self-selection	14
3.4	Analysis of TT2: The risk assumption portfolio of students	17
3.5	Analysis of TT3: Characteristics of students successfully passing their first examination	21
3.6	Analysis of TT4: Success in the next round of competition (i.e. at the retake examination)	25
3.7	New and innovative scientific results.....	30
4	Conclusions and suggestions	32
5	Scientific publications relating to the thesis topic	34

1 Background and objectives

1.1 Topicality and importance

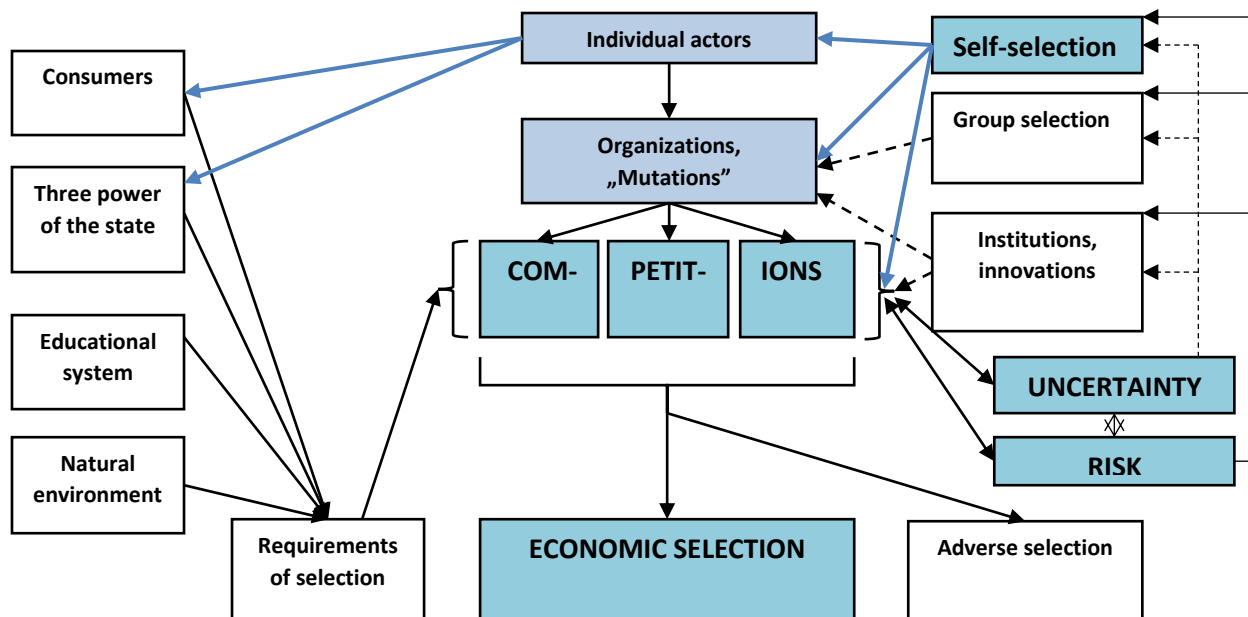
According to STIGLITZ and GREENWALD (2014), the future will bring success, or relatively more success, to countries which are able to establish and maintain, in an effort to alleviate the main problems of economic evolution, the creative and learning abilities of society. The above authors suggest that the following scenarios act against the efficiency of economic development:

- I. when profit is used as the only selection criterion and the exclusive benchmark of conformity;
- II. when players have a short time horizon for planning;
- III. when chances are that economic competition will have a short duration;
- IV. when those creating negative externalities i.e. the beneficiaries of irrational abundance may obtain long-term evolutionary advantages.

The improving conditions of survival will offer economic operators relatively more possibilities for their own “genetic refinement”. Competition must provide a supportive environment for this progress (Figure 1). In particular, an activity pattern that best meets the relevant requirements must be present as a standard. Every player must be able to assess the adequacy of their own activity patterns in comparison with such standard. Competition must ensure favourable conditions for learning the “prime” activity patterns as well as inspire and motivate players to indulge not so much in duplication but rather in primary innovation. However, by its nature, competition is myopic, although in a positive scenario the competition institutions, usually established for a short-term operation only, can actually guarantee the survival of the relevant players in the long run. Naturally, a key role is played in this process by customers who, with their decisions, actually evaluate the performance of economic operators. Nevertheless, the education system has a major influence on customer behaviour and awareness these days.

The relevant uncertainty and risk levels have a crucial impact on the player’s willingness to take part in the competition and to select a community, industry or market to adhere to as well as the activity pattern to be applied. An adequate institutional system may, even under competitive conditions, reduce uncertainty to a level where players will find it more attractive to learn from their own experiences gathered through trial and error than, eventually, to try to obtain the required additional knowledge on their own within the framework of self-selection. The risks, the characteristics of which are more or less monitored by the players, can also be greatly reduced through additional knowledge. On the other hand, a community consisting of relatively efficient members and – therefore – having relatively substantial reserves, is better positioned to mitigate the negative impacts of risks. Actually, a constantly renewing and always competing community is accompanied by such natural factors as uncertainty and risk, which cannot and should not be eliminated. Nevertheless, the uncertainty of players and the level of relevant risks should ideally lead to an adequate activity of players.

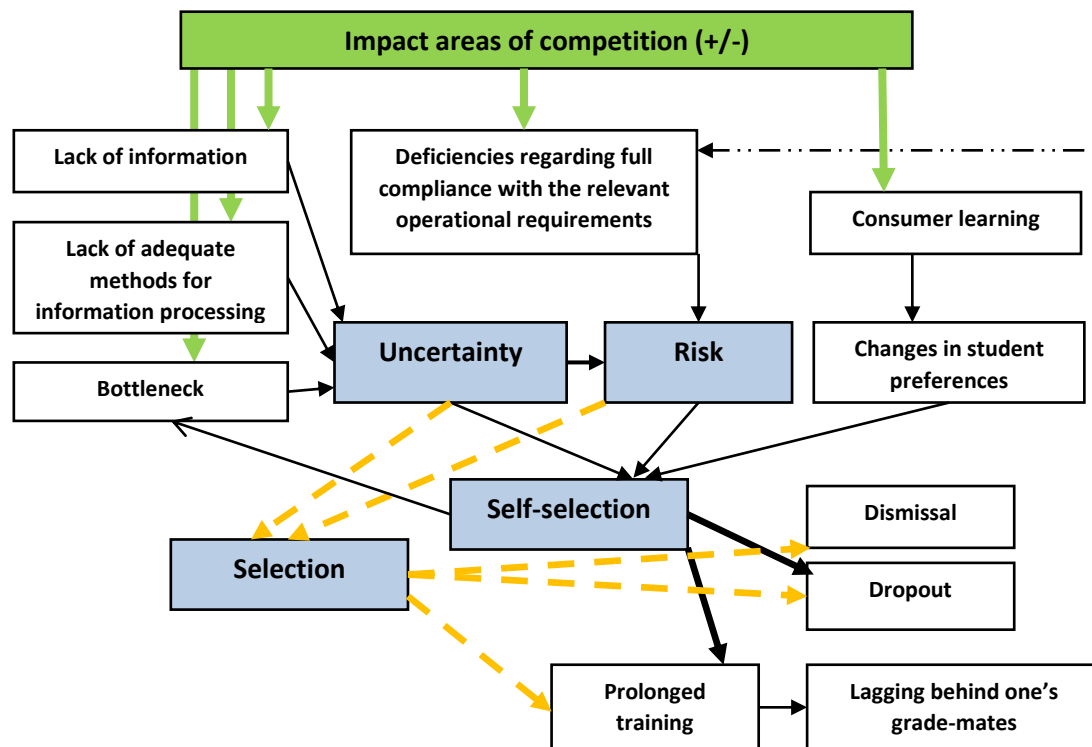
If the institutional system of competition is emptied, selection will be the only thing left in the short run. “Pure selection” carries high risks and uncertainties. Compliance or non-compliance with the requirements will trigger immediate consequences. Poorer quality layers or patterns will be quickly pushed out from the game by better ones.



1. Figure Concept map: Relationships between competition, selection, uncertainty and risk

Education plays a strategic role in the life of a society or economy. Education has a substantial influence on the determination of selection criteria. It forms the minds of all future consumers, workers, managers, legislators, judges, electors and breadwinners. The specificity of education, provided as a service, is that students are deemed as buyers, “raw materials”, participants and partners at the same time. Given that the legal school leaving age is set at 16 years in Hungary, some kind of pressure may be felt by the users of this service until they reach the statutory age. Although all levels of education are important, higher education is the most important level for the replenishment of the future “intelligentsia”. Apart from not being subject to compulsory schooling regulations, higher education is used by adult people who are free to make autonomous decisions. If tailored properly to the development needs of the economy and society in which it is embedded, the higher education system is able to create and maintain an environment for its students where their decisions and resulting activities will be in harmony with the training objectives.

Just like a statistical hypothesis test, higher education may commit two kinds of basic errors. The first is that there are certain higher education graduates who, in reality, would not be worthy of holding a diploma. The second is that there are certain higher education dropouts who, in reality, would be worthy of continuing their studies and obtaining a diploma. Dropping out from higher education may take two forms (Figure 2). One is when the institution screens out and then dismisses a student. The other is when a student decides – maybe under pressure, but surely not from the higher education institution – to discontinue his/her studies. In other words, the student falls victim to selection or self-selection. It is probably not rare in either of these cases that the dropout, in reality, would be worthy of obtaining a diploma.



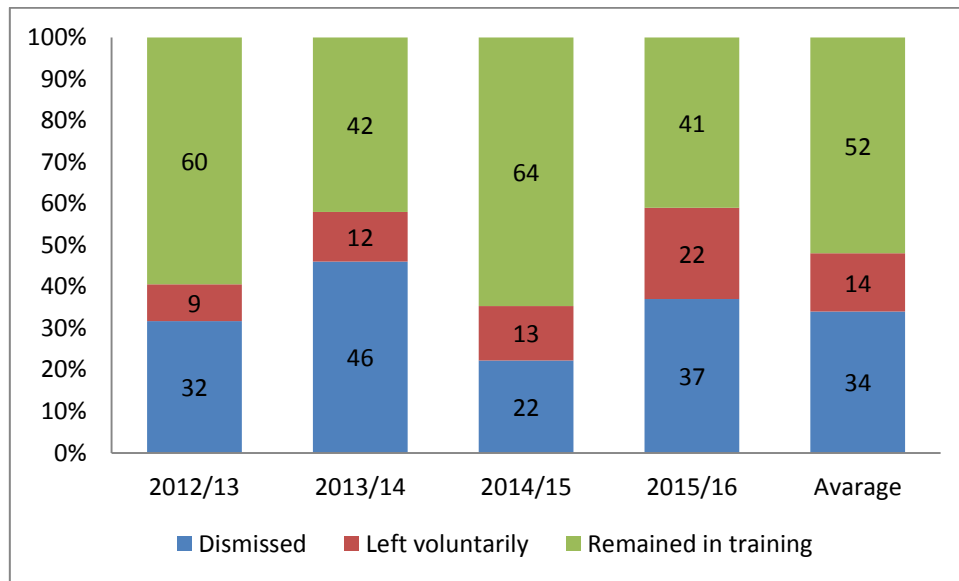
2. Figure Concept map: Selection and self-selection in a higher education institution

Typically, higher education in Hungary almost completely lacks competition, and students can hardly encounter an institution of competition. Furthermore, it may be difficult for students to identify the carriers of prime activity patterns and the characteristics of their underlying activities. Therefore it is rather cumbersome to learn and disperse such patterns. In general, there is a lack of ranks or comparisons, which also makes it difficult for students to assess and put into perspective their own efficiency characteristics. Albeit not intentionally, examination procedures include lots of subjective elements, further increasing student uncertainties and the level of forced risk-taking. These factors are also responsible for the general trend that, as far as certain subjects are concerned, students refuse to sit for an examination or, in many cases, for a retake examination, and that they may even abandon their higher education studies. The introduction of certain competition institutions may reduce student uncertainties and the level of forced risk-taking.

In the average of the past 4 academic years (2012/13, 2013/14, 2014/15, 2015/16), the Eszterházy Károly College of Eger had to dismiss 25% of the students for failure to utilise their examination possibilities. Another 10% of the students left the institution on a voluntary basis. This amounts to a total dropout rate of 35%. However, there were significant differences between the faculties. The Faculty of Natural Sciences produced the highest dropout rate (34%) (Figure 3). Another 14% of the students left the faculty on a voluntary basis. In other words, this faculty loses half of its regular students every year. This represents a serious problem for the institution, for the students and their families and, indirectly, for the entire region.

Therefore it was relevant and important to study the approach of students enrolled in the Faculty of Natural Sciences to uncertainty and risk i.e. two factors having a major – but not

exclusive – influence on both the final (or temporary) self-selection and the outcome of agreed selection.



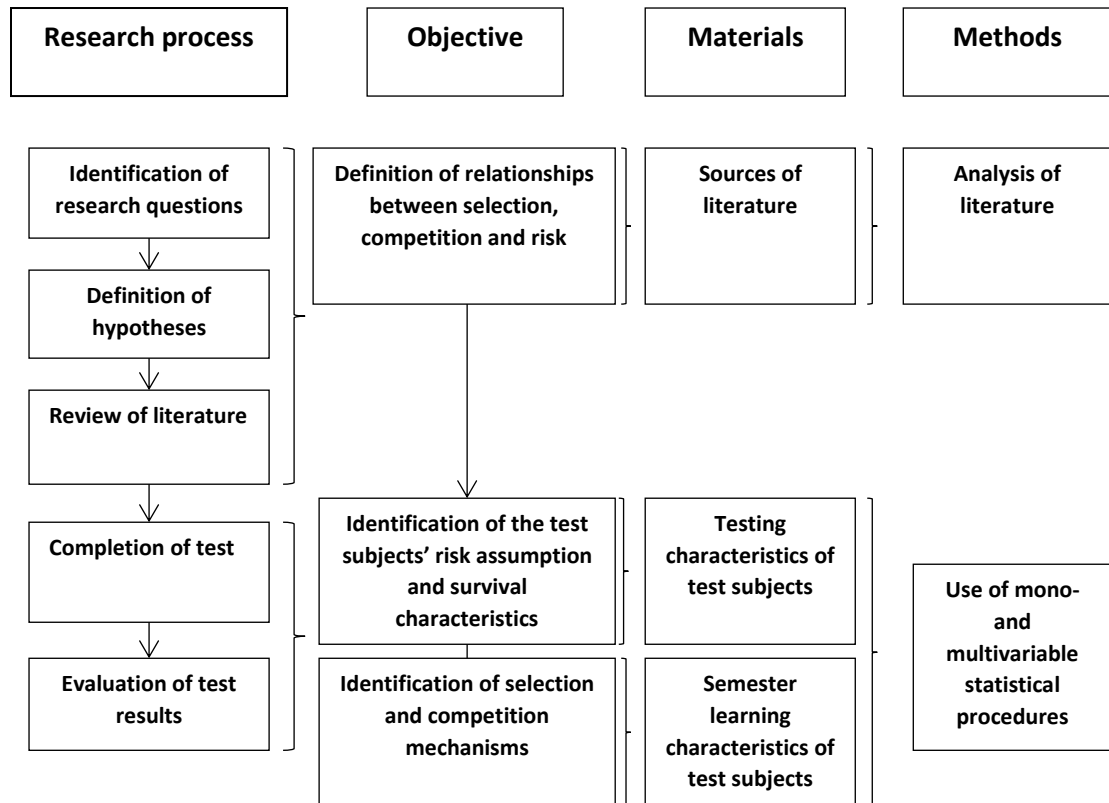
3. Figure Student dropout rates at the Faculty of Natural Sciences of Eszterházy Károly College between September 2012 and June 2016

1.2 Study objectives

My primary purpose was to carry out a thorough overview of the topic of economic competition. After that I was able to describe the concept of economic selection. Then I reviewed uncertainty and risk in order to highlight how these two factors, as well as the players' attitude towards them, determine the success of players in the course of economic selection or competition. Finally, I wanted to use primary research in order to put the above theories to real-life tests within the framework of an advanced course in economics and the related examinations.

In view of the foregoing, I have developed the following study questions:

1. How competition is separated from selection in the process of economic evolution?
2. In terms of economic selection, what are the consequences of someone avoiding competition or giving up halfway (i.e. self-selection)?
3. Who takes greater risks in a competition: those with the weakest position or those with the strongest position?
4. What is the importance of the player's risk assumption strategy in terms of competition and selection?
5. Is it true that players who seem to be the strongest in terms of economic selection will be the most successful in a competition?
6. Is it true that players who are best endowed in terms of economic evolution will be able to utilise the learning possibilities offered by competition and thus achieve competitive/evolutionary advantages?



4. Figure Relationships between research process, objectives, materials and methods
[Source: own editing]

2 Materials and methods

2.1 Test topics (TT) and hypotheses (H)

TT1: Characteristics of students avoiding selection/competition and exercising self-selection.

H1-a: The students who avoid an examination are the ones with the poorest performance indicators: they are able to earn only a low number of credits coupled with a poor general average of grades.

H1-b: The students who avoid a *retake* examination in the semester are the ones with a relatively more positive self-image who primarily wanted to achieve a good general average of grades in the semester and for whom the number of earned credits was of secondary importance.

TT2: The risk assumption portfolio of students.

H2: The expressed risk assumption willingness of students earning less credits and those earning more credits is manifested in the number of “sure” answers and in the number of attended lectures, respectively.

TT3: Characteristics of students successfully passing their first examination.

H3: Students who get extra points for lecture attendance have greater knowledge which permits them to be successful at their first trial, except for extreme cases, regardless of the level of risk assumed by them during the examination.

TT4: Success in the next round of competition (i.e. at the retake examination).

H4-a: Successfully passing the retake examination requires an expansion of technical knowledge as well as a significantly more frequent use of risky tools.

H4-b: In general, students with the best performance indicators are able to pass the retake examination successfully.

2.2 Test layout

The examination included 100 test questions. A total of 6 answer options were given for each question in order to minimise the impact of guesswork by unprepared students on the examination results.

Students were informed before the examination period that the same test questions would be used at the retake examinations. This reason behind this arrangement was to motivate students who were forced or willing to sit for a retake examination to find the correct answers to already known questions by learning or by cooperating with each other. In the basic scenario, each correct answer was given 2 points, amounting to a total of 200 points for 100 questions. The grade limits were set at 60, 70, 80 and 90 percent. The points obtained this way at the examination were increased by additional points: 4 points given automatically for attending a lecture (total: 48 points) and 21 points awarded generally for filling the research questionnaire.

However, students also had the chance to increase their total points received for their correct answers. Of course, they had to pay a price for it. Each question offered students the possibility of confirming their answer to indicate that they were sure of the correct answer without any guesswork or uncertainty. Ticking the question of “sure?” brought 3 (instead of 2) points for students if their answer was correct (Figure 5). However, each incorrect answer was penalised with -1 (instead of 0) point. Furthermore, students feeling absolutely sure of the correctness of an answer could tick, on a strictly voluntary basis, the question of “ultra sure?” as an additional confirmation. In this case, if their answer was correct, they were given 6 (instead of the normal 2) points for that particular question. The popularity of this additional confirmation was undoubtedly limited by the fact that each incorrect answer confirmed as “ultra sure” was penalised with -6 points.

1	A	B	C	D	E	F	Sure? (-1;3) <input type="checkbox"/>	Ultra? (-6;6) <input type="checkbox"/>	-6	-1	0	2	3	6
2	A	B	C	D	E	F	Sure? (-1;3) <input type="checkbox"/>	Ultra? (-6;6) <input type="checkbox"/>	-6	-1	0	2	3	6
3	A	B	C	D	E	F	Sure? (-1;3) <input type="checkbox"/>	Ultra? (-6;6) <input type="checkbox"/>	-6	-1	0	2	3	6

5. Figure Multiple choice and confirmation on the examination sheet [Source: own editing]

Therefore, students were able to customise the scoring of the 100 test questions in accordance with their knowledge characteristics and risk assumption willingness. They were free to confirm their answers by ticking any, all or none of them. Apart from confirming their answers, students had another possibility for obtaining a better grade: they were free to select the grading method (Figure 6).

According to the “traditional” grading method used in Hungary, the actual grade is calculated by applying the total examination score to a standard scheme containing preset and fixed limits. In our case, these limits were set at 60, 70, 80 and 90 percent, except that a maximum of 48 points and 21 points were added to the total examination score for attending lectures and for filling out the questionnaire, respectively.

Select of grading method:			
Traditional	<input type="checkbox"/>	Rank-based	<input type="checkbox"/>
		Good or nothing 62%→3	<input type="checkbox"/>
		Good or nothing 66%→4	<input type="checkbox"/>
		Good or nothing 70%→5	<input type="checkbox"/>

6. Figure Selection of grading method on the examination sheet

The “rank-based” grading method represented the other option. The grade of a student selecting this option depended on the actual group he/she was assigned to among the more than 100 students involved in that day’s examination and ranked in ascending order on the basis of their total score. Students reaching at least 60% (satisfactory level) are assigned to 4 groups on the basis of their total score: best quartile (excellent), second best quartile (good), third best quartile (fair) and bottom quartile (satisfactory). In this method the limits are not preset but determined on the basis of the simultaneous examination performance and the previous lecture attendance rate of students showing up for examination on that day.

The “double or nothing” arrangements represented further grading alternatives. The grade of a student opting for “fair or nothing” could be either fair (at and above 62 percent) or unsatisfactory (below 62 percent), while the grade of the same student reaching 60 percent would have been better than unsatisfactory both under the “traditional” and the “rank-based” system. However, the grade of the same student would have been fair only above 70 percent in the “traditional” grading method. The grade of a student opting for the “good or nothing” alternative could be either good (at and above 66 percent) or unsatisfactory (at or below 65 percent). Nevertheless, this arrangement was chosen by only a negligible percent of students.

A total of 525 students joined the course in the semester and, except for a few dropouts, both their general average of grades for the semester and their taken and earned credits data were available. The research questionnaire (see details below) were filled only by 408 persons sitting for the examination. 120 of them filled it twice because they had to sit for a retake examination. Another 122 students failed to sit for a retake examination.

Prior to completing their examination test, students had the chance to go through a list of 20 statements regarding their general self-assessment i.e. self-image. By using a four-step scale, they had to indicate their agreement with each statement regarding their mental state. The list contained 15 positive and 5 negative statements. The list of statements was designed on the basis of the Rosenberg self-esteem scale (ROSENBERG, 1965), the self-efficacy scale (KOPP, SCHWARZER, JERUSALEM, 1993) and the Beck depression inventory (BECK et al, 1961; RÓZSA, SZÁDÓCZKY, FÜREDI, 2001).

Prior to completing their examination test, the students had the chance to go through a list of 20 statements regarding their “daily” mental state prevailing at the start of the examination. By using a four-step scale, they had to indicate their agreement with each statement regarding their “daily” mental state. The list contained 10 positive and 10 negative statements. The list of statements was designed on the basis of the Hungarian version (SIPOS, SIPOS, SPIELBERGER, 1988) of the State-Trait Anxiety Inventory (STAI) (SPIELBERGER, 1975).

Once they were finished with the two lists of 20 questions regarding their self-image and daily mental state, the students answered 18 questions about uncertainty and risk. A 9-step

scale was assigned to each of these 18 closed questions so that even minor variations could be identified with regard to the respondents and their answers.

The analysis of the answers given to the 18 questions reveals the students' uncertainty tolerance and risk assumption profile. However, the examination test also shows a profile with regard to actual uncertainty tolerance and risk assumption in a real-life situation. The comparison of these two profiles may lead to significant conclusions.

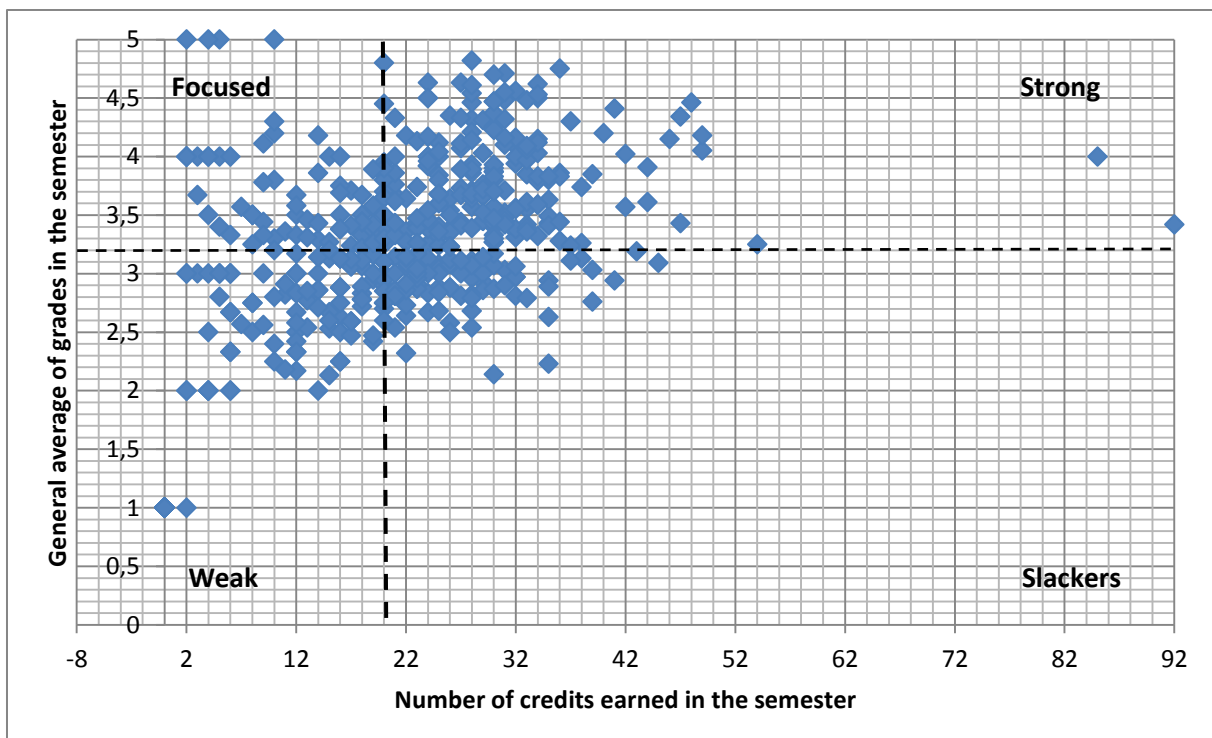
3 Results

3.1 Two-dimensional group analysis

As a prelude, and partial supplement, to three-dimensional (3D) group analysis, relying, among others, on subsequent self-image values, the number of credits earned in the semester and the general average of grades in the semester were included in the two-dimensional (2D) group creation as follows (Figure 7).

The relatively good performing students earned a relatively high number of credits (at least 23) and, at the same time, achieved a good general average of grades (at least 3.21) in comparison with others. In academic terms, they belong to the group of "Strong" indeed. It is interesting to note that no excellent students belonged to this group in the semester. It means that excellent performance necessitated a concentration on earning less credits.

Although others could produce a relatively high credit earning performance, their general average of grades failed to exceed 3.20. Quantity is not coupled with quality in their case, so they are the group of "Slackers".



7. Figure Position of members of the 4 groups

Some students either needed to earn less credits or deliberately wanted to earn less credits so that they could use their resources in a more concentrated way. They earned maximum 22 credits but their general average of grades was at least 3.21. They form the group of “Focused” where, presumably, the general average of grades takes precedence, at least in the short run.

Finally, some students earned less credits coupled with a general average of grades below 3.20. They can be rightly assigned to the group of “Weak”.

The internal averages of the four basic groups show significant differences even in terms of the dimensions which are above the same interval. Both the Weak and the Slackers produced a general average of grades below 3.21, although the Weak (with less credits) reached, on average, only 2.32, while the Slackers went up to 2.92.

Both the Focused and the Strong have a general average of grades above 3.20. However, despite pooling all excellent students, the Focused (3.67) underperform the Strong (3.80) by 13 percent points. It seems that the lower number of earned credits is not only a facilitator of a higher general average of grades, by inhibiting students to fritter away their resources, but it is also a consequence of less efficient learning activities.

Although both the Weak and the Focused earned less credits, the Focused, who could boast with a better general average of grades, earned an average of 50 percent more credits (15 credits). At the same time, the good credit earners Strong (29 credits) and Slackers (31 credits) show only little difference, with 2 credits in favour the poor learner Slackers. Here it is obvious that no such assumption may receive confirmation according to which higher credit earnings and better general averages go hand in hand. That is why it is justified to create groups on the basis of these two learning performance indicators; they carry important differences, regardless of whether those are causes or consequences.

3.2 Three-dimensional group analysis

Two-dimensional group creation was carried out according to the number of credits earned in the semester (22 and less, and more than 22) and the general average of grades in the semester (3.2 and below, and above 3.2). As shown in the previous section, the 2 x 2 criteria led to the creation of 4 groups: Weak, Focused, Slackers and Strong. This group creation method had the advantage of allowing for the analysis of students who took the study subject but avoided the examination and, therefore, they did not fill any questionnaire or examination test.

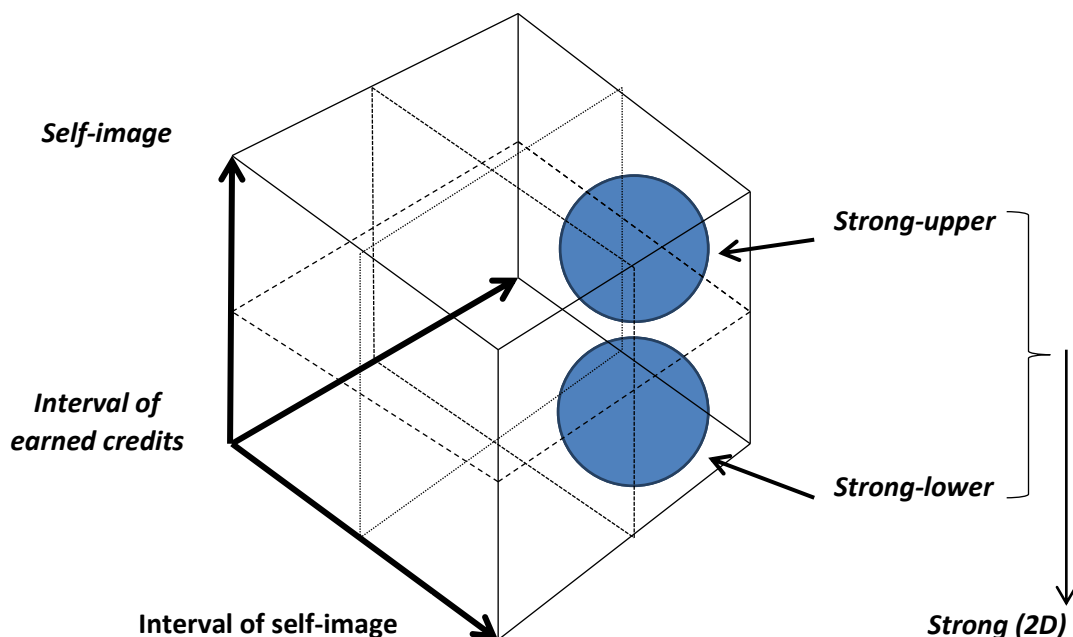
At the same time, students who showed up for the examination completed a fairly detailed psychological test regarding their daily mental state and their general self-image. According to the assessment of the 18 questions in economics – not included in the examination –, self-image also plays or may play a major role in terms of the students’ uncertainty tolerance, risk assumption and absorption capacity.

Thus it was advisable to add self-image characteristics to the group creation process in the case of the 408 students who showed up for the examination ([Table 1](#)). In order to achieve comparability with the two-dimensional group analysis, the previous 4 groups were retained but each was divided along the dimension of self-image. The student self-image was determined as the simple arithmetic mean of the student answers given to the self-image related set of questions.

1. Table Credit earning, semester general average of grades and self-image characteristics of the 8 subgroups

Subgroup	Interval of earned credits	Interval of general average of grades	Interval of self-image	Share (% of 408 persons)	Share in the 4 (2D) groups
Weak-lower	0 - 22	1 - 3,2	0 - 1,50	7%	(27%)
Weak-upper	0 - 22	1 - 3,2	1,51 - 3,00	19%	(73%)
Focused-lower	0 - 22	3,21 - 5	0 - 1,50	5%	(28%)
Focused-upper	0 - 22	3,21 - 5	1,51 - 3,00	13%	(72%)
Slackers-lower	23 - ∞	1 - 3,2	0 - 1,50	6%	(40%)
Slackers-upper	23 - ∞	1 - 3,2	1,51 - 3,00	9%	(60%)
Strong-lower	23 - ∞	3,21 - 5	0 - 1,50	11%	(27%)
Strong-upper	23 - ∞	3,21 - 5	1,51 - 3,00	30%	(73%)

Numerically, its values were confined to the open interval between 0.00 and 3.00. The middle limit of 1.50 (still in the lower category) was obtained after the creation of equal class intervals. Students with a higher self-image value were assigned from the basic 4 groups to the upper range, while those with a self-image value not exceeding 1.50 were put in the lower range. This led to the creation of 8 subgroups (Table 1).



8. Figure Position of the 8 subgroups in space

The newly created 8 subgroups do not have the same number of members, as the purpose of group creation was to separate students with similar characteristics. In fact, the 4 basic groups were created along the same concept i.e. to avoid arbitrarily set limits and the same number of members for each group. Therefore the limits between the 4 basic groups were set in view of the actual separation. As no such option for natural separation showed up when self-image was introduced as an additional dimension, the limit was defined by the halving point of possible self-image values (Figure 8). Therefore 29% and 71% of the students were assigned to the “lower subgroup” and the “upper subgroup” of self-image, respectively. These percentages were followed more or less by all 4 basic groups (2D), except for the Slackers where 40% of the members belonged to the lower subgroup (more negative self-image). In

lack of the relevant reference data, it is impossible to state whether the average share of 29% in the lower subgroup is too high or too low.

3.3 Analysis of TT1: Characteristics of students avoiding selection/competition and exercising self-selection

Only the two-dimensional group analysis can provide important information about the students who avoided the examination after the advanced course in economics. As to the Focused and the Strong, both groups showing a better general average of grades (3.20<), the students closing the semester with the best general average of grades (3.81 and 3.81) were the ones who actually avoided the examination (Table 2). Yet, these examination avoiders showed a great (3x) difference between their earned credits: Focused examination avoiders: 10 credits, Strong examination avoiders: 29 credits. The difference is smaller (2x) in the case of examination takers (15 credits vs. 31 credits). However, as to the Slackers and the Weak, both groups showing a poorer general average of grades, the students closing the semester with the worst general average of grades (2.89 and 1.78) were the ones who actually avoided the examination. The same was true also for the Slackers and the Strong, known to be relatively good credit earners. Although the examination avoiders did not earn substantially less credits – Slackers: 29 and Strong: 29 – than the examination takers (29 and 31), their general average of grades showed a marked drop: only 2.89 for the examination avoider Slackers.

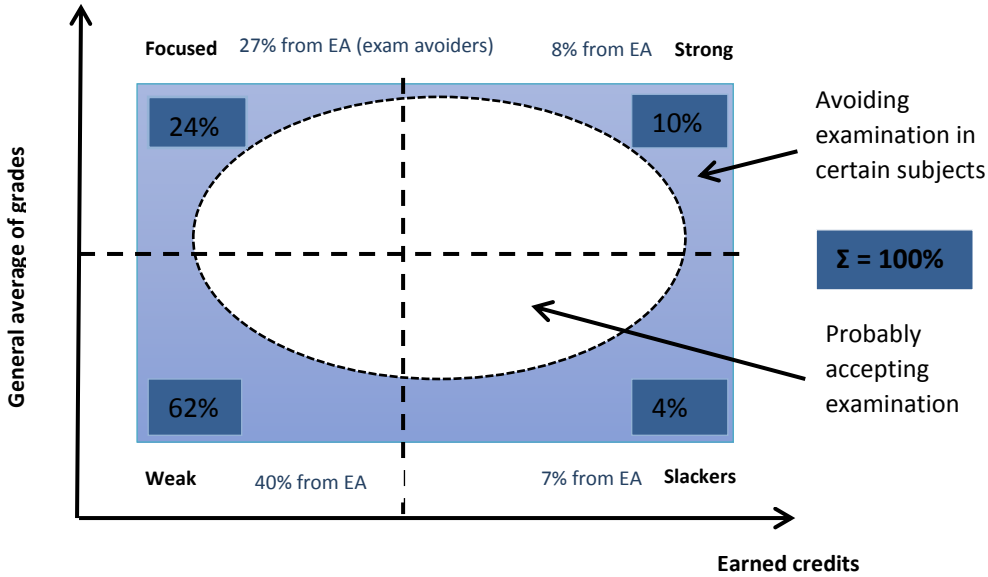
2. Table Credit earning and semester general average of grades characteristics of the 4 groups

Subgroup	Interval of earned credits	Interval of general average of grades	Earned credits on mean			General average of grades on mean		
			Σ	Exam takers	Exam avoiders	Σ	Exam takers	Exam avoiders
Weak	0 - 22	1 - 3,2	10	14	5	2,32	2,69	1,78
Focused	0 - 22	3,21 - 5	15	16	10	3,67	3,62	3,81
Slackers	23 - ∞	1 - 3,2	29	29	29	2,92	2,92	2,89
Strong	23 - ∞	3,21 - 5	31	31	29	3,80	3,80	3,81
Total:			21	24	9	3,17	3,35	2,52

Overall, it is clear that, for some of the studied aspects – earned credits or general average of grades –, the examination avoiders can be considered more extreme than the examination takers (Figure 9). The examination was refused by the best performers in groups showing a higher general average of grades (Strong and Focused) and by the worst performers in groups achieving a lower general average of grades (Weak and Slackers). In other words, the examination avoiders typically belong to the extreme part of their category. The situation is similar also in the case of earned credits. The examination avoiders came mostly from the upper segment of the relatively better performing groups (Slackers and Strong) and markedly from the worst performers from the poorer performing groups (Weak and Focused).

An analysis of the share of individual groups within the set of examination takers and that of examination avoiders shows that although the majority (60%) of the Weak belongs to examination takers, the same group provides the highest share of examination avoiders (62%). The Focused group is also overrepresented (24%) within the set of examination avoiders. However, in many cases, avoiding the examination is not caused by learning or ability problems but simply justified by tactical considerations. Actually, the higher general average

of grades of the Focused group, giving all excellent students, is mostly due to the fact that the group members focus on earning the credits for which they can obtain better grades.



9. Figure Accepting or avoiding examination in 4 groups

The group members avoid examinations when they cannot see real chances for obtaining fine grades. This tactical consideration of examination avoiders is further confirmed by the fact that 8% of the members of the Strong group also avoided the examination despite the fact that this group earns the highest number of credits coupled with a relatively high general average of grades.

Avoiding the examination is a manifestation of self-selection (Table 3). As suggested also by the test findings, certain students decided to exercise self-selection because, according to their preliminary judgement, they would not be able to comply with the selection criteria.

3. Table Accepting or avoiding examination in 4 groups

Group	Number of person	Share (525 person)	Share of examination takers (408 person)	Share of examinations avoiders (117 person)	Share of examination avoiders in the group (group=100%)
Weak	178	34%	26%	62%	40%
Focused	102	19%	18%	24%	27%
Slackers	64	12%	14%	4%	8%
Strong	181	34%	41%	10%	7%
Total:	525	100%	100%	100%	-

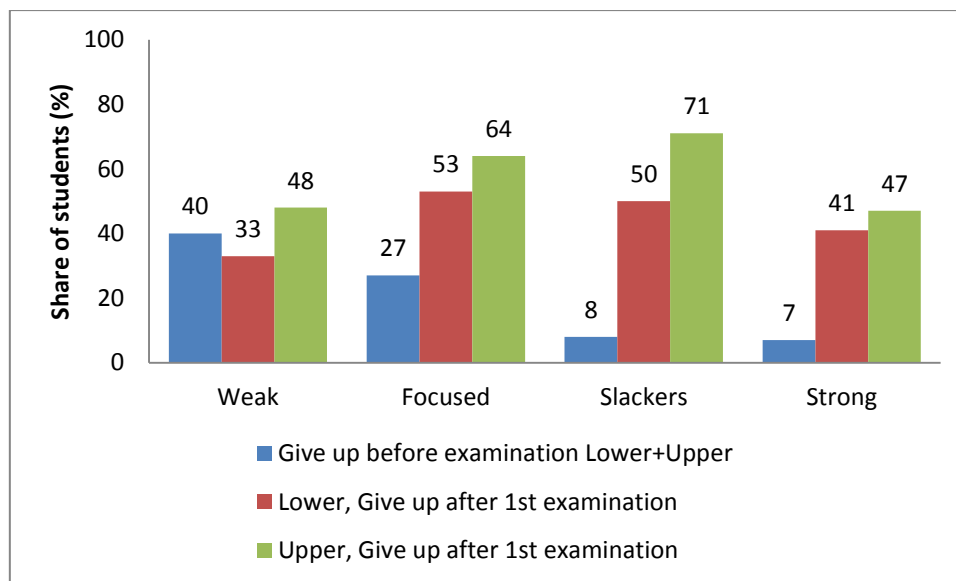
However, certain other students decide to exercise self-selection not for their fear of risking non-compliance but for their intention to achieve or maintain – temporarily – more favourable conditions. In either case, self-selection means the same for the advocates of the above two motives: by failing to accept the challenge i.e. take on the examination, they renounce an opportunity of learning from experience.

The completed tests have verified hypothesis H1-a, according to which examination is avoided by students with the poorest performance indicators: low number of credits earned in the semester coupled with a poor general average of grades. Such performance indicators are typical of the Weak. According to the result of the Chi-Square test of independence ($p < 0.001$), it is **statistically verifiable** at a significance level of 5% that the number of credits earned in the semester and a membership in the four groups created according to the average general of grades obtained in the semester have a significant influence on whether a student attempts to take an examination in the test subject.

Yet, as it is described above, only the “extreme” students of this group (least number of credits or lowest general average of grades in the semester) are characterised by this kind of strong self-selection. Basically, they do not have favourite subjects or teachers, and they accept to sit for an examination only if there is no way to postpone it anymore or if even they can meet the low requirements.

Therefore, prior to the first examination, members in the two subgroups of the Weak produced the highest rate of self-selection (40%) (Figure 10). As the self-image of examination avoiders could not be assessed, the only possibility in the case of such students was to determine whether they belonged to a specific group pair on the basis of their learning characteristics shown during the semester.

Following the first examination, about half of the failed students (120 persons) opted for a retake examination, while the other half (122 persons) refused it. However, this rate of interim self-selection (averaging 50%) was unevenly distributed among the 8 subgroups. Interestingly, the members in the two subgroups of the Weak were least prone – but not in a negligible manner – to *interim self-selection* (jointly averaging 44%).



10. Figure First examination avoiders vs. 4 groups and retake examination avoiders (as a percentage of failed students) vs. 8 subgroups

Members in the lower subgroups (relatively lower self-image) of each group were significantly less inclined to give up their efforts after the failure of their first examination.

Hypothesis H1-b – according to which the *retake* examination is avoided by students of relatively higher self-image whose primary purpose for the semester is to achieve a good general average of grades instead of a high number of credits – has not been verified. The retake examination was avoided really by students of relatively higher self-image but

they did it not in the hope of obtaining a better general average of grades, within the framework of abandoning the problem subject, which was the typical behaviour of the Focused. Actually, the Focused earn, on average, a high number of credits but concentrate their resources on the first examination. This group pair and, in particular, the – more generous – members of higher self-image in the upper subgroup of the Focused were clearly most inclined to exercise *interim self-selection*. According to the result of the Chi-Square test of independence ($p=0.10$), it is **statistically not verifiable** at a significance level of 5% that a membership in the **upper subgroup of the Focused** has a significant influence on whether a student, after failing at the first examination, attempts to take a repeat examination. However, according to the result of the Chi-Square test of independence ($p=0.04$), it is **statistically verifiable** at a significance level of 5% that a membership in the **upper subgroup of the Slackers** has a significant influence on whether a student, after failing at the first examination, attempts to take a repeat examination.

4. Table Examination success and use of repeat-related learning opportunities in the 8 subgroups (total: 408 persons)

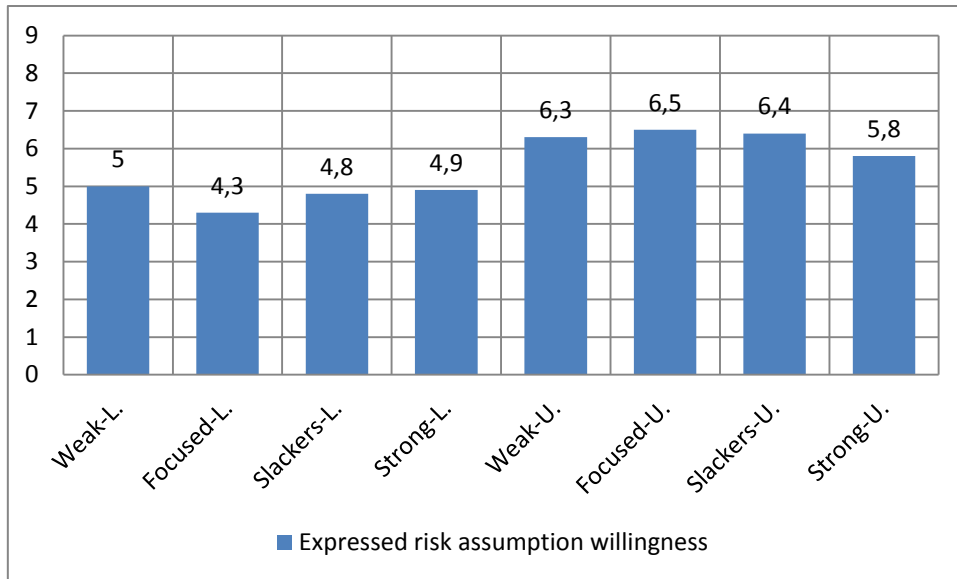
Subgroup	Passed first examination	Failed first examination, gave up	Passed retake examination	Failed retake examination	Σ	Total passed exam	Failed first examination but learnt from it ¹
Weak-L.	25%	25%	14%	36%	100%	39%	19%
Focused-L.	29%	38%	10%	24%	100%	38%	13%
Slackers-L.	67%	17%	0%	17%	100%	67%	0%
Strong-L.	52%	20%	11%	17%	100%	63%	23%
Weak-U.	23%	37%	10%	29%	100%	33%	13%
Focused-U.	38%	40%	6%	17%	100%	43%	9%
Slackers-U.	40%	43%	6%	11%	100%	46%	10%
Strong-U.	50%	24%	11%	15%	100%	61%	23%

3.4 Analysis of TT2: The risk assumption portfolio of students

Apart from the various simulations, Q8² in the risk questionnaire *openly and directly asked respondents to rate the extent of their inclination to take risks*. Answers ranged on a scale from 1 to 9, the latter being the highest level of risk assumption (Figure 11). *Students of relatively lower self-image tended to declare themselves less inclined to take risks*. On average, their level of risk assumption proved to be 4.8, while that of the students of higher self-image reached 6.1. The largest difference (2.2) was found between the two subgroups of the Focused and the smallest one (0.9) was identified between the two subgroups of the Strong. The same differences were 1.2 and 1.6 for the Weak and the Slackers, respectively. Therefore, in line with the applicable literature findings, the role of the self-image is clearly important but other characteristics also seemed decisive. The student's answer to the risk assumption question was assessed together with the student's pre-examination lecture attendance and the actual risk assumed by the student at the examination. This way the study could highlight the student's use of the so-called answer confirmation tools. The review of the number of answers marked as "sure" produced interesting results.

¹ Passed retake examination/failed first examination (%)

² Q8 means question No. 8 of the questionnaire about uncertainty and risk.



11. Figure Risk assumption willingness expressed by students from 1 to 9

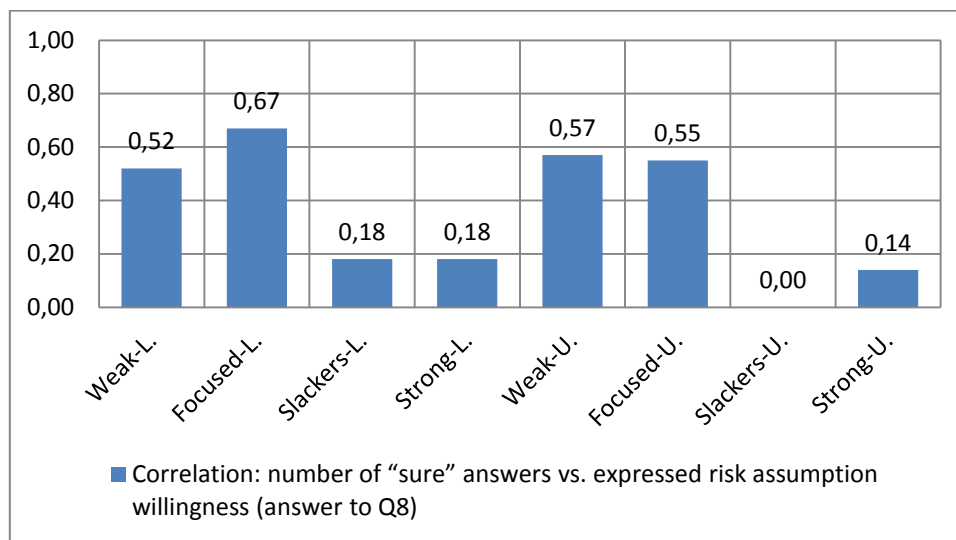
According to the initial research plan, the number of “sure” answers would have expressed the level of risk assumption willingness as this tool is used – somewhat contrary to its designation – by the student to increase the chance of the correct answer, although the student is not 100% sure of the correctness. Therefore, the student is aware of the fact of taking a risk with the use of the “sure” tool. The “ultra sure” tool is used when the student is really sure of an answer. Although a real gentleman does not bet on sure things, a student using the “ultra sure” tool is actually doing exactly that.

Nevertheless, the level of risk assumption willingness was expressed only partially in the number of “sure” answers. As to the Weak and the Focused, it was clearly evident that the students who considered themselves as more courageous risk takers actually risked using a higher number of “sure” tools. The common feature in the subgroups of the Weak and the Focused is that students of these 4 subgroups earned a relatively low number of credits in the semester. At the same time, students of these 4 subgroups attended half as many lectures as the members of the group pairs of the Focused and the Strong who, on average, also attended only half of the lectures. Therefore the Weak and the Focused do not accumulate reserves of anything including, in particular, any reserve of knowledge. That is why, among other things, these two groups provided 86% of the students who avoided the examination of the test course and 55% of the students who failed in the semester. Finally, 76% of the students in the four subgroups of these two groups were unable to complete the test course in the semester. They consider retreat, avoiding problems or solving problems through self-selection as a normal behaviour instead of continuous learning. Given that they do not adequately perceive the expansion and complexity of risks associated with a successful examination, their perceived risks in terms of the test course were limited mainly to the number of “sure” answers and to the losses eventually resulting from them. They did not perceive the real risk involved in their non-attendance of course lectures.

In contrast, the four subgroups of the Slackers and the Strong were able to earn a relatively high number of credits during the semester. On top of that, students in the two subgroups of the Slackers stuck to the majority of the subjects taken by them despite the fact that it caused a relative deterioration of their general average of grades in the semester. As avoiding the examination or the retake examination is not a basic attitude for students in these four

subgroups, they already perceive the importance of accumulating reserves, mostly in terms of knowledge, for the successful completion of a course and for handling the related risks (Figure 12).

According to the results, the number of “sure” answers was primarily determined not by the expressed risk assumption willingness but by the knowledge of students in the four subgroups of the Slacker and the Strong. In addition to their significantly higher rate of lecture attendance, these students simply considered more answers worthy of being confirmed with the “sure” tool. In the presence of greater knowledge the relative state of self-image is not so important anymore. In this test the risk attitude of the Slackers and the Strong is expressed not in the number of “sure” answers but in their reserves of credits and knowledge i.e. in their rate of lecture attendance.



12. Figure Correlation between the expressed risk assumption willingness (answer to Q8) and the number of “sure” answers in the 8 subgroups

The share of first-grade students was highest in the four subgroups of the *Weak* (74%) and the *Focused* (69%). It is interesting and important to note because in the case of first-grade students there were certainly no logistic problems hindering them from attending the lectures. Besides, lower grade students tend to have a higher rate of lecture attendance.

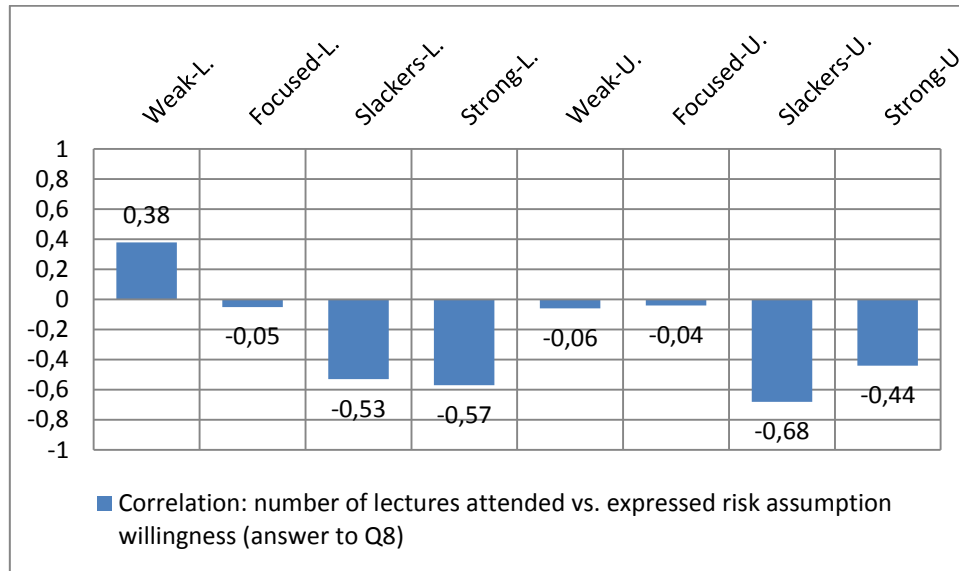
Therefore, as it is clearly shown below (Table 5), the four subgroups of the *Weak* and the *Focused* typically concentrate such students from all grades who have a low rate of lecture attendance (below 30%).

5. Table Number of lectures attended in the 8 subgroups by grade

Subgroup	Average number of lectures attended			
	1. grade	2. grade	3. grade	Total
Weak-lower	3,8	1,8	1,5	3,1
Focused-lower	3,7	2,8	1,0	3,3
Slackers-lower	8,6	5,1	3,3	6,9
Strong-lower	7,1	5,4	5,0	6,0
Weak-upper	3,8	1,3	0,3	3,0
Focused-upper	4,1	0,1	0,7	2,9
Slackers-upper	6,3	2,5	1,8	4,4
Strong-upper	6,8	3,9	1,7	5,0
Total:	5,3	3,5	1,4	4,3

In contrast, members of the four subgroups of the *Slackers* and the *Strong* attributed a relatively greater importance to lecture attendance (Figure 13). They attended almost twice as many lectures i.e. they skipped, on average, half of the 12 lectures.

Mostly the members of lower subgroups “excelled” in this regard: first-grade students in the lower subgroup of the *Slackers* and in the lower subgroup of the *Strong* skipped only one-third of the lectures.



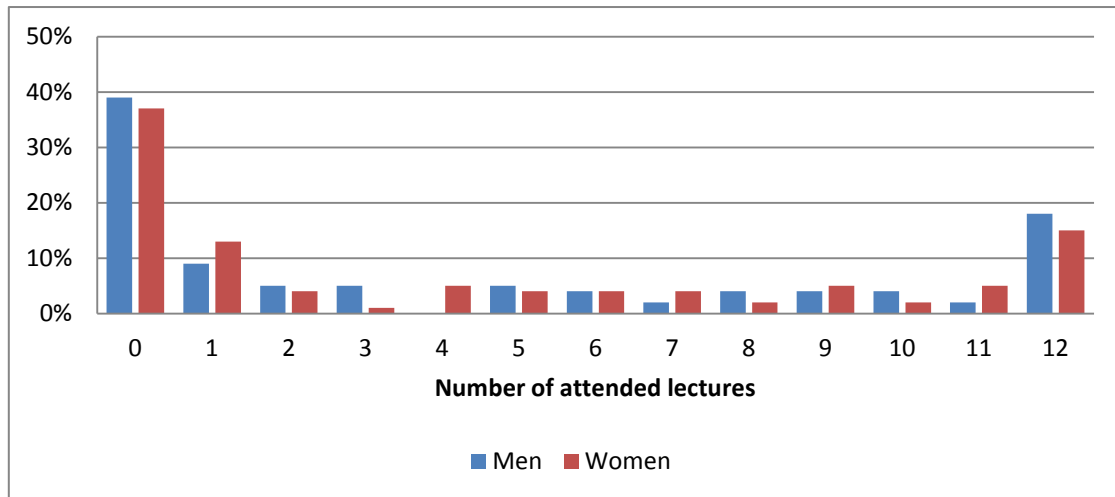
13. Figure Correlation between the expressed risk assumption willingness (answer to Q8) and the number of lectures attended in the 8 subgroups

The answers given to Q8 about risk assumption willingness match the rate of lecture attendance only for the four subgroups of the *Slackers* and the *Strong*. However, there is no such match in the case of the four subgroups of the *Weak* and the *Focused*. It is clear that the four subgroups of the *Slackers* and the *Strong* perceive the primary risk in their inadequate preparation for the examination i.e. in the insufficiency of their reserves of credits and knowledge for their success at the desired level. As discussed above, the use of such seemingly risky options as the “sure” tool is actually not risky for them because their greater knowledge allows them to control these tools successfully to their own benefit.

Hypothesis H2 – according to which the expressed risk assumption willingness of students with less credits and that of students with more credits is manifested in the number of “sure” answers and in the number of attended lectures, respectively – has been verified. Actually, the use of the “sure” tool was strongly linked with the expressed risk assumption willingness only in the case of the subgroups of the *Weak* and the *Focused* (showing a low rate of lecture attendance and earning a relatively low number of credits in the semester). Hypothesis H2 was verified in their case. At the same time, the expressed risk assumption willingness of students in the subgroups of the *Slackers* and the *Strong* (attending, on average, twice as many lectures and earning a relatively high number of credits in the semester) was strongly linked with the rate of lecture attendance.

3.5 Analysis of TT3: Characteristics of students successfully passing their first examination

Lecture attendance did not show any normal distribution. The majority of the population is not concentrated at all around the average attendance rate of 4 lectures. In fact, the majority is made up of extreme attendance rates, and the two extremities “attracts” the rest. This is an U-shape distribution. 38% of all students enrolled in the course skipped all lectures, and half of them attended a maximum of one lecture (Figure 14). However, 17% of them attended all lectures, and 20-20% of them skipped a maximum one lecture. It should be noted that 25% of the examination takers also skipped all lectures.



14. Figure Lecture attendance and gender

Evidently, this rate is much higher (90%) among the examination avoiders. Only 11 students of the 117 examination avoiders attended at least one lecture (Table 6).

6. Table Lecture attendance and examination willingness (person/408) (person/117)

0 Lct.	1 Lct.	2 Lct.	3 Lct.	4 Lct.	5 Lct.	6 Lct.	7 Lct.	8 Lct.	9 Lct.	10 Lct.	11 Lct.	12 Lct.	Σ
Examination taken by 408 person													
156	43	18	12	11	18	16	11	11	19	11	14	68	408
38%	11%	4%	3%	3%	4%	4%	3%	3%	5%	3%	3%	17%	100%
Examination not taken by 117 person													
106	3	2	2	0	0	0	0	0	1	0	0	3	117
91%	3%	2%	2%						1%			3%	100%

As – in an effort to increase lecture attendance willingness – 4 bonus points were awarded per lecture, the probability of obtaining better grades should have been gradually increased in line with the rising rate of lecture attendance. However, it was not the case at all (Figure 15).



15. Figure Lecture attendance and grade obtained at first examination (408 person)

Seemingly, more opportunities opened up for obtaining better grades for students attending 4 and 5 lectures than for those who attended 6 and 7 lectures. It is a good example – to be discussed later – a higher rate of lecture attendance alone did not mean any guarantee for obtaining a better grade. In many cases, lecture attendance was already a consequence of the students' different awareness, thoroughness and learning abilities. Nevertheless, only 5% of the students attending at least 10 lectures failed at the first examination, while the same rate was 92% for those who skipped all lectures.

As to the first examination, the outstanding success (67%) of the lower subgroup of the Slackers and the fairly good result (40%) of the upper subgroup of the Slackers demonstrate best the great differences between the upper and the lower subgroups in terms of lecture attendance (Table 7). In this particular case it means some 10 points i.e. 2.5 lectures, while the examination takers attended, on average, 4.3 lectures. In all subgroup pairs, students with a relatively lower self-image put more efforts in lecture attendance. In turn, they were able to accumulate greater reserves both in terms of knowledge and bonus points. However, except for the two subgroups of the Strong, this accumulation of reserves mostly took place only in terms of bonus points and not in terms of knowledge. Nevertheless, mainly those students excelled in the accumulation of bonus points who were able to earn a relatively high number of credits in the semester i.e. the four subgroups of the Slackers and the Strong. With their 25% rate of lecture attendance, the Weak and the Focused accumulated only half as many bonus points.

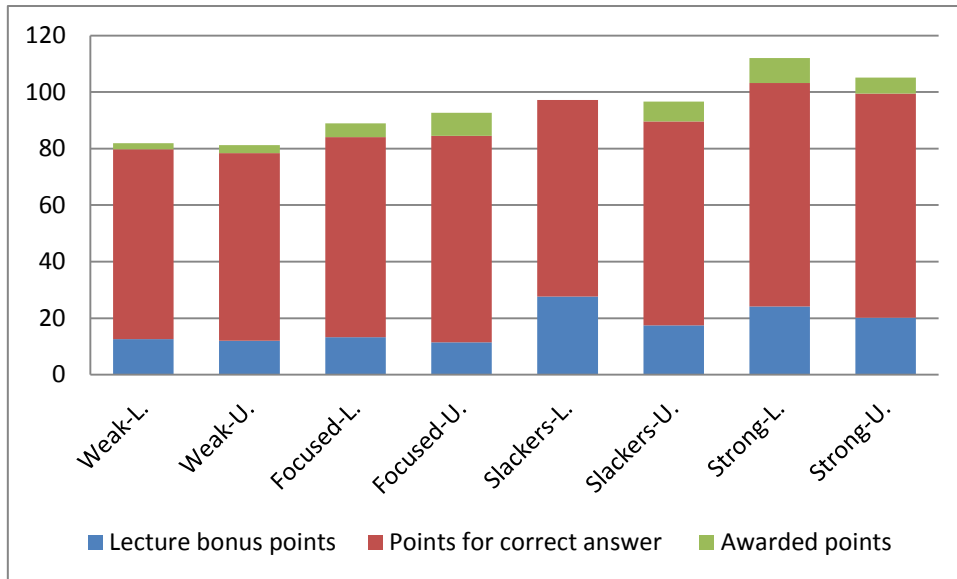
The intellectual abilities and the additional knowledge obtained through lecture attendance can be actually surveyed on the basis of the number of correct answers given to the 100 test questions (Table 7). Both subgroups of the Strong showed outstanding results (79.0 and 79.4). There is no difference between the upper and the lower subgroup in this regard. Similarly, there is no real difference in terms of subject knowledge between the upper and the lower subgroup of the poorest performing Weak (67.1 and 66.4). However, the lower subgroup of both the Focused and the Slackers show a considerably poorer performance.

7. Table Summary of examination success components and characteristics for the 8 subgroups (408 person)

Subgroup	1st exam: success (%)	2nd exam: success (%)	Total exam success (%)	Lect. bonus points (/48)	Points for correct answer (/200)	Awarded points (/400)	Total (/648)	Grade obtained at 1st exam	Selected grading method	Minus gap of selected grading method
Weak-L.	25	14	39	12,6	67,1	2,2	81,9	1,25	1,21	0,07
Weak-U.	23	10	33	12,0	66,4	2,8	81,2	1,38	1,36	0,08
Focused-L.	29	10	38	13,3	70,8	4,8	88,9	1,62	1,33	0,14
Focused-U.	38	6	43	11,5	73,0	8,2	92,7	1,79	1,38	0,11
Slackers-L.	67	0	67	27,7	69,5	-0,1	97,1	2,08	1,25	0,42
Slackers-U.	40	6	46	17,5	72,1	7,0	96,6	1,80	1,31	0,11
Strong-L.	50	11	63	24,2	79,0	8,8	112,0	2,30	1,37	0,15
Strong-U.	52	11	61	20,2	79,3	5,6	105,1	2,21	1,34	0,22
Total:	41	9	50	17,3	73,5	5,3	96,1	1,87	1,34	0,16
Lower subgroups	45	9	54	20,1	72,8	3,6	96,5	1,89	1,30	0,18
Upper subgroups	39	9	48	16,0	73,8	4,2	94,0	1,86	1,35	0,15

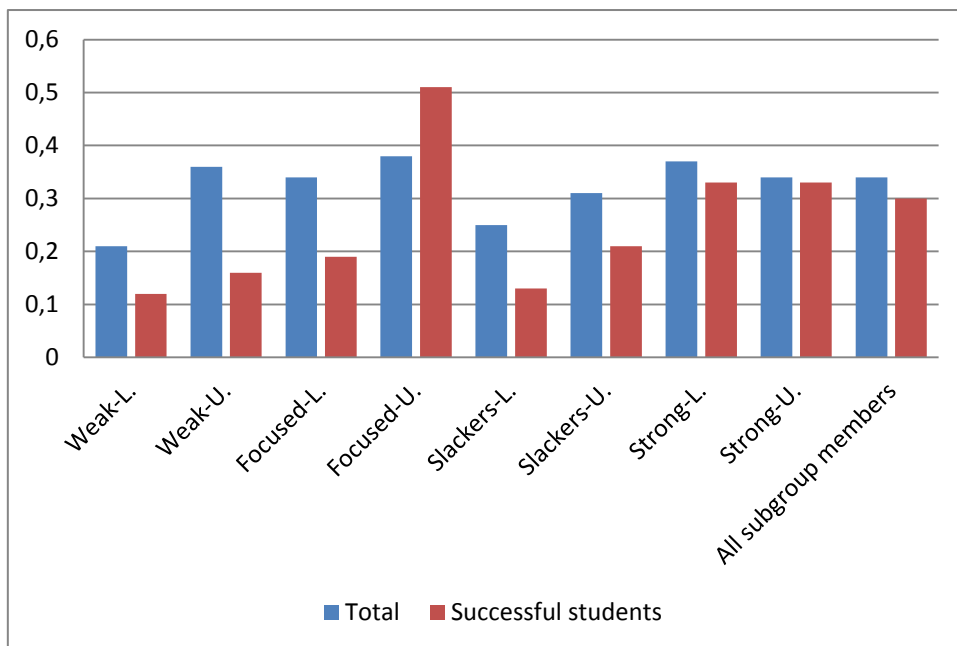
Nevertheless, with regard to the points obtained through the use of the “sure” and “ultra sure” tools, it is clearly seen that up to a certain level of student quality – up to the Slackers – the upper subgroup members of higher self-image are always awarded more points. As it was seen before, it is due to the fact that students of higher self-image always confirmed more answers with the tools. This trend was seen also with the Strong, but only with regard to the use of the “ultra sure” tool. As a matter of fact, the lower subgroup of the Strong was more active in the use of the “sure” tool, and the two variations offset each other in terms of awarded points.

The four subgroups of the Slackers and the Strong, earning a relatively higher number of credits in the semester, showed the best overall performance. In particular, the upper and lower subgroup of the Strong – otherwise able to produce better general average of grades in the semester – achieved a substantial advantage (Figure 16). As to the performance of these four subgroups, the higher rate of lecture attendance was a major component, although their advantage in terms of knowledge also remained important, manifested in more correct answers, regardless of the correct use of the “sure” and “ultra sure” tools. True to their designation, the two subgroups of the Focused made a relatively efficient choice between the normal, “sure” and “ultra sure” answers. However, not even the extra points gained this way could counteract the low rate of lecture attendance and the – at least – partially resulting disadvantage in terms of knowledge. The selected grading method (1 = traditional; 2 = rank-based) may also have substantially influenced not so much the fact but rather the extent of success at the examination (given that the limit for a satisfactory grade was identical and preset under both methods).



16. Figure Number and composition of acquired points in the 8 subgroups (first examination only)

It is evident (Figure 17) that a convincing majority of students (67%) preferred to enjoy the predictability of the traditional method, even despite the fact that most students passing the examination obtained a relatively lower grade. The background of it is that students have very limited information on the performance indicators of other students and, therefore, avoided any involvement in a competition for fear of being outperformed by other students. In this regard, self-selection was mostly typical of the lower subgroup of the Weak (79% opted for the traditional grading method). The upper subgroup of the Focused showed the highest preference for the rank-based grading method, with only 62% opting for the traditional grading method.



17. Figure Support for rank-based grading method (from 0 to 1) at first examination among all subgroup members and among students who passed

Overall, the relatively higher self-image led – except for the two subgroups of the Strong – to a greater support for the rank-based grading method. Remarkably, the rank-based grading method was less popular among successful examination takers in all groups, except for the upper subgroup of the Focused. It suggested that the successful examination takers included mostly the students who tried to avoid taking risks coupled with high uncertainty.

Hypothesis H3 – according to which students who get extra points for lecture attendance have greater knowledge which permits them to be successful at their first trial, except for extreme cases, regardless of the level of risk assumed by them during the examination – has not been verified. The levels of correlation were as follows: 0.29 between lecture attendance and the number of correct answers at the first examination, -0.01 between lecture attendance and the number of “sure” answers, and -0.05 between lecture attendance and the selected grading method. However, the lower subgroup of the Slackers (showing the highest rate of lecture attendance) the same low number of correct answers as the upper and lower subgroup of the Weak (displaying the poorest performance indicators). By far the highest – almost identical – number of correct answers were given by the upper and lower subgroups of the Strong, although their rate of lecture attendance was, on average, 10-25% less than that achieved by the lower subgroup of the Slackers. The potentials offered by the “sure” answers and the selected grading method remained marginal for the lower subgroup of the Slackers (showing the highest rate of lecture attendance) but proved to be important for the lower group of the Strong (showing the second highest rate of lecture attendance) who were awarded the highest number of points (in absolute terms) or the second highest number of points (in relative terms) through their use of the answer confirmation tools. While the lower subgroup of the Slackers was the greatest opponent of the rank-based method, the lower subgroup of the Strong was the second greatest supporter of the rank-based method. In view of the marked difference between these two subgroups, the hypothesis could not be verified. This further demonstrates that lecture attendance, alone, is insufficient unless it is coupled with adequate learning methods and absorption capacity.

3.6 Analysis of TT4: Success in the next round of competition (i.e. at the retake examination)

As announced to them well in advance, students were given the same 100 test question at the retake examination with the purpose of allowing them, by minimising the level of uncertainty, to apply a more targeted learning method, deepen their knowledge and decide on risk assumption.

As it can be seen below ([Table 8](#)), at the retake examination a total of 120 students showed up, accounting for 23% of all course students and 50% of the students who failed at the first examination. 32% of the repeating students was able to show real progress and pass the retake examination. The students who failed again at the retake examination reached, on average, the level at which the now successful students failed at their first examination. Most of the students who failed again were unable to show such progress (49% on average) at a single retake examination which was sufficient for the now successful students to obtain a satisfactory grade. The lower subgroup of the Slackers (known for its high rate of lecture attendance) clearly shows a situation where, regardless of the highest rate of progress (137%), the low initial level makes it impossible to reach a state of real development. The lower subgroup of the Slackers did very well at the first examination (success for 67% of its members) but it was too late for the remaining members to catch up without adequate

perseverance. It should be noted that, within their subgroups, these students displayed the lowest rate of lecture attendance but realised of its importance only when it was already too late.

8. Table Changes in total points acquired for examination result in the 8 subgroups (first two examinations)

Subgroup	PASSED THE SECOND EXAMINATION				FAILED AT THE SECOND EXAMINATION			
	Lecture bonus points	Acquired at 1st exam	Acquired at 2nd exam	Growth	Lecture bonus points	Acquired at 1st exam	Acquired at 2nd exam	Growth
Weak-lower	17,0	73,8	108,8	47%	2,4	66,9	69,4	4%
Focused-lower	14,0	60,0	103,0	72%	14,0	60,0	58,0	-3%
Slackers-lower	-	-	-	-	9,0	25,3	59,8	137%
Strong-lower	19,2	66,0	93,6	42%	8,0	63,0	70,4	12%
Weak-upper	0,5	70,8	107,8	52%	5,2	56,7	61,8	9%
Focused-upper	9,3	69,3	99,3	43%	5,8	60,0	63,1	5%
Slackers-upper	14,0	69,0	95,0	38%	2,0	57,8	70,8	23%
Strong-upper	8,3	72,1	108,5	51%	6,1	54,8	68,9	26%
Total:	9,7	70,2	105,0	49%	6,0	57,2	65,5	18%

However, some 27% of students in the two subgroups of the Weak did realise of its importance; surprisingly, they started at a relatively high level and produced, on average, a progress of 51%. Actually, at the retake examination they obtained the highest number of points (109-108), as many as the members of the upper subgroup of the Strong. The upper subgroup of the Weak performed remarkably well, mostly in view of the fact that its members practically skipped all lectures: in fact, they were left behind by any subgroup of failed students in terms of lecture attendance. It suggests that most students in the upper subgroup of the Weak would be capable of achieving better results but great performance remains ad hoc for them in lack of an established methodology. Nevertheless, these students proved that the extra points awarded for lecture attendance did not determine the results of examination, although, in general, the failed students had a really low record of lecture attendance.

Therefore, students passing the retake examination increased the number of their obtainable points by 50% on average. As it is shown below (Table 9), an average progress of 20% in terms of correct answers was already sufficient for a successful retake examination.

9. Table Changes in basic points acquired for correct answers at the first two examinations in the 8 subgroups (progress of repeated examination takers)

Subgroup	PASSED THE SECOND EXAMINATION			FAILED AT THE SECOND EXAMINATION		
	Acquired at 1st exam	Acquired at 2nd exam	Growth	Acquired at 1st exam	Acquired at 2nd exam	Growth
Weak-lower	74	86	16%	66	70	6%
Focused-lower	62	86	39%	62	64	3%
Slackers-lower	-	-	-	49	64	31%
Strong-lower	68	80	19%	62	65	6%
Weak-upper	68	83	22%	59	63	8%
Focused-upper	67	77	15%	60	61	2%
Slackers-upper	63	83	32%	58	64	11%
Strong-upper	75	87	17%	62	65	5%
Total:	70	84	20%	60	64	7%

The students who failed for the second time were also able to show progress, although it was rather negligible in terms of energy input and, in addition, it started from a lower base.

The successful members of lower subgroups gave 22% more correct answers than the members of upper subgroups, which helped them catch up in terms of correct answers (41.7 and 42.2).

It is encouraging to note that all students were able to increase the number of their correct answers at the retake examination.

As it shown below (Table 10), students at the first examination represented a “higher quality” as they were able to obtain, on average, 74 basic points for their correct answers, while it was only 71 basic points at the retake examination.

10. Table Changes in basic points acquired for correct answers at the first two examinations in the 8 subgroups (characteristics of successful subgroup members)

Subgroup	All students from 1st exam (408 person)	All students from 2nd exam (120 person)	Passed 1st exam (166 person)	Passed 2nd exam (38 person)	Point growth for students passing 2nd examination
Weak-lower	67	75	67	→ ↑86	12
Focused-lower	71	70	87	86	24
Slackers-lower	69	63	77	0	0
Strong-lower	79	71	91	80	12
Weak-upper	66	68	76	→ ↑82	15
Focused-upper	73	65	85	77	10
Slackers-upper	72	70	80	→ ↑83	20
Strong-upper	79	74	90	87	12
Total:	74	71	85	84	14

At the first examination, the most modest performers were the lower and upper subgroup of the Weak (67 and 66 points). However, the situation changed substantially at the retake examination, where the “remaining members” of the lower subgroup of the Weak became the best performers (75 points) but the upper subgroup of the Weak also overtook 2 other subgroups (68 points). Among the successful students at the retake examination the lower subgroup of the Weak performed at the same level as the upper subgroup of the Strong in terms of correct answers (86 and 87 points). The lower subgroup of the Focused also achieved similar results (87 points).

Apart from a growth in the number of correct answers, some important changes took place in the use of the “sure” and “ultra sure” tools. The already successful students modified their former methods to a large extent. As it is shown below (Table 11), successful students increased the number of their “sure” and “ultra sure” answers by 52% and 364%, respectively, despite the fact that each wrong “sure” and “ultra sure” answer resulted in the deduction of 1 point and 6 points, respectively. However, they could improve the correctness of their “sure” and “ultra sure” answers to 60% and 80%, respectively.

Although the students who failed again at the retake examination increased the number of their “sure” and “ultra sure” answers by 100% and 116%, respectively, the correctness of their “sure” and “ultra sure” answers remained at 40% and 60%, respectively. Among the successful students, the four subgroups of the Focused and the Weak reached the highest correctness rate (100% and 90%) with their “ultra sure” answers. The latter correctness rate was achieved by the lower and upper subgroup of the Weak through an increase of the number of their “ultra sure” answers by 1850% and 215%, respectively.

11. Table Changes after the first examination in the number of “sure” and “ultra sure” tools used by students passing and failing at the second examination in the 8 subgroups

Subgroup	PASSED THE SECOND EXAMINATION						FAILED AT THE SECOND EXAMINATION					
	Sure sign	Growth %	Ultra sign	Growth %	Award points	Growth %	Sure sign	Growth %	Ultra sign	Growth %	Award points	Growth %
Weak-lower	6,8	42	9,8	1850	22,8	9200	2,8	12	2,7	35	-0,8	-214
Focused-lower	5,0	-44	24,0	1500	17,0	950	8,4	-7	3,2	113	2,0	200
Slackers-lower	-	-	-	-	-	-	26,8	529	9,8	44	-3,8	-84
Strong-lower	14,0	59	4,8	26	13,2	925	6,1	23	5,0	60	5,4	258
Weak-upper	5,8	21	10,3	215	25,3	677	14,7	200	3,8	40	-1,6	-14
Focused-upper	8,0	300	8,0	200	22,0	1000	3,6	78	5,7	155	2,4	450
Slackers-upper	12,0	300	2,5	150	12,0	100	7,8	138	6,8	800	6,8	2600
Strong-upper	6,9	-6	8,6	49	21,2	862	6,3	-2	7,8	126	4,1	161
Total:	8	52	9	364	21	1231	9,1	100	5,3	116	1,5	118

At the same time, the correctness rate of their “sure” answers remained only at 30% and 50%, and therefore they practically could not increase the number of points received for their “sure” answers. Only the successful members of the upper subgroup of the Focused and the upper subgroup of the Slackers reached a higher increase in the number of their “sure” answers (300% and 300%) than in the number of their “ultra sure” answers (200% and 150%). At the same time, the members of these two subgroups increased the correctness rate of their “sure” answers to 60% and 80%, respectively. It means that they used the “sure” tool for several questions where the use of the “ultra sure” tool would have resulted in extra points for them.

The students who passed the retake examination were simply better prepared from the repeated test questions – at least from the ones they could remember. However, knowledge characteristics behind the growth in the number of correct answers remained hidden. The general increase in the use of the “sure” tool and, in particular, the “ultra sure” tool clearly shows that although the number of correct answers did not increase significantly, the additional correct answers were based on deeper knowledge. With uncertainty eliminated, the “ultra sure” answers were not perceived too risky either. Where uncertainty was only lowered, the use of the “sure” tool may have been advisable all the same. It is clearly demonstrated also by the data series of the students who failed again at the retake examination.

When faced with the completely new type of test arrangements at the first examination, students in all 8 subgroups preferred to use the “sure” tool (-1;3) rather than to use the “ultra sure” tool (-6;6). However, they were careful with the “sure” tool as they used it, on average, only for every 20th question. The “ultra sure” tool was used even more rarely i.e. approximately only for every 30th question (Table 12). Typically, students with more earned credits and a higher self-image used both tools more often. The 166 students who passed the first examination preferred to use, in all 8 subgroups, the “sure” tool (45% more) rather than to use the “ultra sure” tool and, in comparison with the average examination takers, they used 12-20% more of both tool types.

12. Table Use of “sure” and “ultra sure” tools and success at the first and second examination in the 8 subgroups

Subgroup	All students from 1st exam (408 person)		All students from 2nd exam (120 person)		Passed 1st exam (166 person)		Passed 2nd exam (38 person)		Point growth for students passing 2nd examination	
	Sure sign	Ultra sign	Sure sign	Ultra sign	Sure sign	Ultra sign	Sure sign	Ultra sign	Sure sign	Ultra sign
Weak-lower	2,6	1,8	3,9	4,7	2,1	1,9	6,8	9,8	2,0	9,3
Focused-lower	3,2	2,2	7,4	9,1	2,3	5,2	5	24	-4,0	22,5
Slackers-lower	5,6	4,5	26,7	9,7	6,3	4,3	-	-	-	-
Strong-lower	6,5	3,6	9,1	4,9	7,7	3,9	14	4,8	5,2	1,0
Weak-upper	5,1	3,3	12,4	5,5	4,2	3,8	5,8	10,3	1,0	7,0
Focused-upper	4,9	3,5	4,7	6,2	6,8	4,5	8	8	6,0	5,3
Slackers-upper	6,0	3,1	9,2	5,3	7	5,1	12	2,5	9,0	1,5
Strong-upper	6,1	4,0	6,6	8,2	6,4	4,3	6,9	8,6	-0,4	2,9
Total:	5,4	3,5	8,7	6,5	6,1	4,2	7,8	9,0	1,7	5,3

By the time of the retake examination, students got familiar with the test arrangements and tried to benefit from the inherent special potentials. They did it especially because they had already lost the opportunity of a successful examination. At the same time, the 100 test questions also remained unchanged. Due to these two elements, there was a substantial growth in the general use of the “sure” tool (+61%) and, mostly, the “ultra sure” tool (+86%). Typically, the subgroups of the Strong and the Focused (known for their better general average of grades) used, except for the lower subgroup of the Strong, more “ultra sure” tools than “sure” tools. The average student who passed the retake examination already used 28% more “sure” tools and 114% more “ultra sure” tools. Remarkably, successful students in the lower subgroup of the Strong and in the upper subgroup of the Slackers used much more “sure” tools than “ultra sure” tools in comparison with the first examination. The lower subgroup of the Strong reached a correctness rate of 70% for “sure” answers and 90% for “ultra sure” answers, while the same rates were 60% and 100%, respectively, for the upper subgroup of the Slackers. Therefore, the different behaviour of these two subgroups seems to be based on a very strict risk strategy, if such a thing may be relevant at all in the case of students.

At the retake examination the lower subgroup of the Slackers showed a particularly deviant behaviour when it increased the average number of “sure” and “ultra sure” answers by 300% and 50%, respectively. The resulting correctness rate was only 35% for the overused “sure” tool and 65% for the “ultra sure” tool. It is not surprising that no member of this subgroup was able to pass the retake examination.

The lower subgroup of the Focused also behaved in an extreme manner but only in comparison with their previous examination data. Actually, the same students previously gave 80% more (9) “sure” answers and 16 times less (1.5) “ultra sure” answers. However, their success justified them, mostly because their correctness rate was 75% for the “sure” answers and 66% above the extra benefit level for the “ultra sure” answers.

Hypothesis H4-a – according to which successfully passing the retake examination requires an expansion of technical knowledge as well as a significantly more frequent use of risky tools – has been verified. The average improvement of 50% in the number of points of successful examination takers consists of a 20% increase in the number of correct answers, while the remaining 30% came from the use of the “sure” and “ultra sure” tools.

Students at the first examination refrained from the use of both tools but, in particular, the very risky “ultra sure” tool. However, this pattern changed drastically by the time of the retake examination. Successful examination takers increased the number of their “sure” and “ultra sure” answers by 52% and 364%, respectively, on average. The number of their resulting extra points rose by 1231%, on average, at the retake examination. According to the result of the Chi-Square test of independence ($p=0.20$), it is **statistically not verifiable** at a significance level of 5% that the number of bonus points earned **at the first examination** has a significant influence on whether a student passes the first examination. However, according to the result of the Chi-Square test of independence ($p<0.001$), it is **statistically verifiable** at a significance level of 5% that the number of bonus points earned **at the repeat examination** has a significant influence on whether a student passes the repeat examination.

Hypothesis H4-b – according to which, in general, students with the best performance indicators are able to pass the retake examination successfully – has not been verified. As to the best performing lower subgroup and upper subgroup of the Strong, only the latter was able to “stick” to the worst performing lower subgroup and upper subgroup of the Weak at the retake examination. Surprisingly, both subgroups of the Weak belonged to the forefront with regard to the number of correct answers, but they were the absolute winners in terms of the extra points received for their correct use of the answer confirmation tools. In particular, the lower subgroup of the Weak excelled in this regard as they increased the number of their extra points by 9200%. Actually, the phrase “the last will be first” became true in their case. With a substantial reduction in the level of uncertainty, the two subgroups of the Weak felt motivated enough to put real effort into the successful completion of the subject.

13. Table Point growth (basic + awarded point) for students passing 2nd examination

Group	Point growth (basic + awarded point) for students passing 2nd examination	Standard deviation	Coefficient of variation
Weak	71,1667	21,0533	0,2958
Focused	67,8000	19,6870	0,2904
Slackers	57,5000	0,7071	0,0123
Strong	70,5789	14,5270	0,2058
Total:	69,7106	16,3126	0,2340

3.7 New and innovative scientific results

The new and innovative results of this thesis are described below.

I have proved through tests that, at the retake examination following a failed attempt, students with a relatively higher self-image and an ability to earn a higher number of credits coupled with a low general average of grades are inclined to exercise interim self-selection. These students concentrate their efforts on the first examination, after which they are unable to achieve renewal, and their absorption capacity drops temporarily. The self-image reasons of examination avoidance could not be clarified as no questionnaire was filled by these students. However, in all 8 subgroups mostly the students having a relatively higher self-image were inclined to exercise interim self-selection i.e. give up halfway. Among them outstands the upper subgroup of the Slackers (able to earn a relatively high number of credits coupled with a lower general average of grades in the semester). These students seem diligent with a relatively high rate of lecture attendance during the semester but, in reality, their absorption capacity is low. They are able to concentrate only on a single examination without

any ability for renewal. Furthermore, they cannot benefit from the opportunities offered by predictability. Having a low level of fighting spirit, these students are not sufficiently motivated or inspired.

I have proved through tests that students with a relatively higher inclination for self-selection and earning a low number of credits do not perceive the skipping of lectures as a real risk assumption. However, students earning a relatively high number of credits and showing, in particular, a lower general average of grades do perceive it as a real risk assumption. In general, students with a higher self-image (i.e. members of the four upper subgroups) considered their risk assumption willingness higher than that of others. However, according to an analysis of two risk assumption areas, the most important role was not played by self-image during a real risk assumption. The risk assumption willingness expressed by members of the subgroups of the Weak and the Focused was manifested in their use of – really risky – confirmation tools at the examination. However, in the case of the subgroups of the other two groups, it was manifested in the number of attended lectures. Actually, the Weak and the Focused (typically males and first-grade students) showed a low rate of lecture attendance and, according to two-dimensional group analysis results, gave 86% of all examination avoiders. These student lack the right methodology and fail to adequately perceive that examination-related risks can be reduced mainly during the semester through lecture attendance and the accumulation of additional knowledge or, in this case, extra points.

I have proved through tests that offering a possibility to acquire knowledge or using incentives to enforce lecture attendance leads to real knowledge expansion only in the case of students in possession of advanced learning techniques including motivation and inspiration. In other words – as the proverb goes – you can lead a horse to water but you cannot make it drink. Students with an ability to earn a relatively high number of credits during the semester were, on one hand, adequately motivated by bonus points to attend lectures but, on the other hand, they would have probably attended them anyway. Nevertheless, they realised the importance of lecture attendance for a successful examination. At the same time, the relatively low correlation of 0.29 between lecture attendance and the number of correct answers at the first examination may be attributed to subgroups, and mainly to the lower subgroup having a relatively lower self-image, of the Slackers (able to earn a relatively high number of credits coupled with a lower general average of grades in the semester). They showed the highest rate of lecture attendance but gave as few correct answers as the lower subgroup of the Weak (having the poorest performance indicators). Despite that, the lower group of the Slackers was the most successful (67%) at the first examination, although all remaining members failed at the retake examination. The outstanding success rate was due to the bonus points awarded for lecture attendance. In lack of bonus points, it would have been the least successful group. According to evaluation results, it is due to the fact that members in the two subgroups of the Slackers act rather systematically.

I have proved through tests that students making a failed examination attempt after an intensive initial self-selection and having the poorest performance indicators and a relatively lower self-image give the best reaction to a significant reduction of examination-related uncertainties. The highest share of students (40%) avoiding already the first examination was displayed by the subgroups of the Weak (earning the lowest number of credits coupled with the lowest general average of grades in the semester). The two worst results of the first examination were produced, in terms of examination score, by the lower and upper subgroup of the Weak. In addition, they were awarded the lowest number of bonus points for their lecture attendance. Therefore these two subgroups were the least successful at

the first examination. Despite that, the students in the lower subgroup of the Weak who failed at the first examination (75% of the subgroup) showed the lowest level of avoidance regarding the retake examination. Only 33% of them opted for interim self-selection, while the same share was 42% and 48%, respectively, for the lower and upper subgroup of the Strong (showing the best performance indicators in the semester). As far as the acquired points were concerned, the lower subgroup of the Weak showed the greatest progress at the retake examination. Accordingly, students of this subgroup were able to acquire, on average, the highest number of points, and it was also the most populous subgroup of examination takers. The analysis confirmed that this extraordinary progress was due to the fact that students were able to prepare for answering the already known 100 test questions at the retake examination. Naturally, this opportunity was available also for other subgroups. Yet, only students having the worst performance indicators were able to fully benefit from it. It is actually a sign that a more predictable – but not alibi – examination represents a motivation and inspiration of catching up exactly for the students who are most vulnerable to dropout.

4 Conclusions and suggestions

Following a review of the topics of economic selection and competition, it has become possible to study a different aspect of the practical implementation of both selection and competition, including the system of challenges in Hungary's higher education. The presence of preset point limits for grading purposes and the privacy-related regulations prohibiting students to inspect the results of others represent two major blows to competition among students. Due to the preset point limits, individual success is not related to the composition of examination takers. The official prohibition of disclosing the examination results of others does not allow students to identify those persons whose preparatory work or activity pattern should be followed or adopted by other students.

It means that although students are challenged, the results are the same as if they were operating in an isolated manner. In other words, it is impossible to use such basic functions of competition as motivation, inspiration, comparison with the performance of others or the possibility to identify, study or adopt the most successful activity patterns. Such kind of challenge is “only” a selection and not a competition. Thus we cannot see such beneficial consequences of competition as increased compliance with the relevant requirements at group level (i.e. constant development) or the gradual elimination of efficiency gaps.

The success of selection can also be deteriorated by any obstacle (e.g. logistic problems or lack of textbooks) hindering the preparatory process of students. Uncertainties and examination-related risks are also greatly increased by the fact that the details of challenge requirements cannot be known in advance. These factors lead to an increased number of students who avoid examinations i.e. exercise self-selection. This further limits their learning options, increasing the probability of their unsuccessful future selection. First, they lose their informal source of information supply among their own grade-mates and, second, in lack of challenges such as examinations they will not acquire practical experiences that would help them adopt more successful activity patterns for the preparatory process. Self-selection is detrimental to the efficient use of the absorption capacity of students.

Student dropout is a major problem in higher education. It may take place through self-selection or selection, and the affected students cannot get help from the institution of competition. My tests described here have proved that reducing the level of uncertainty during repeated – but not alibi – examinations leads to a great improvement of results exactly for the

students who are most affected by dropout. Therefore, these students are not unworthy of continuing their studies but they exercise self-selection in the face of high risks and uncertainties. The same students are ready to make efforts for better compliance with the requirements, provided that such requirements are specified precisely.

For various reasons, including the importance of statistical processing, these tests always used the same 100 test questions. Therefore, students were not able to inspect the marking sheets and the official correct answers after the examination. Actually, it would have been evident in the case of proper competition as it would create the settings for students to learn from their mistakes and, as a result, perform better in the future. The use of the same test questions made it possible but only to a limited extent; although it allowed students to acquire the right pattern but only in exchange for recurring attempts. It (would have) meant repeated examinations.

Surprisingly, the test subjects welcomed the opportunity of having some influence on their fate and on the examination rules. Although it meant substantial extra work for the examiner but it motivated and inspired students to learn and to attend the lectures. This arrangement could eliminate partly – but not fully – the lack of real competition in higher education and examinations.

It may seem a contradiction but students should be placed in a competitive environment and, at the same time, the level of risks and uncertainties should be reduced in the field of preparation and examination. Although competition increases students' uncertainty and generates additional risks in certain fields but it also offers a compensation in return. Nevertheless, increasing the predictability of examinations and ensuring the autonomous elaboration of a part of the competition rules would reduce the level risks and uncertainties perceived by students. The reason is that this way students may adjust competition to their preparatory patterns or vice versa.

In view of the above conclusions, I wish to make the following suggestions – not only for higher education:

1. The exact selection or competition requirements should be made available for consultation in advance;
2. The requirements should be stable enough to allow for adaptation;
3. Students should be able to know precisely – at least subsequently but in a very short time – the expected manner of full compliance with each of the individual requirements;
4. Students should be able to know the persons who fully complied with the applicable requirements as well as their activity patterns used for such compliance;
5. Successful activity patterns should be made available – not for free but without obstacles – for adoption and duplication;
6. Students must be able to identify precisely the weaknesses and strengths of their own activity patterns;
7. Students must be given clear guidelines about how the efficacy of their activity patterns relate to that of others and, in particular, to that of more successful students;
8. Students must be given some margin and freedom of decision for creating their own activity patterns or for getting involved, even if indirectly, in the formation of selection or competition rules.

5 Scientific publications relating to the thesis topic

Proofread foreign language articles published in foreign technical reviews abroad:

Csorba, László (2012) The Crisis and Possible Future of Euro as an Institution; GSTF Journal on Business Review, Volume 1, No. 4. pp. 45-50. ISSN: 2010-4804

Csorba, László (2012) Issues related to the conceptual changes and perception difficulties of scarcity (2012) GSTF Journal on Business Review, Volume 2, No. 2. pp. 85-90. ISSN: 2010-4804

Proofread foreign language technical book chapters published abroad:

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