Public Speaking Aversion and Gender Gaps: Evidence from a Field Experiment

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Public speaking is an important skill for career growth and in leadership positions, but it tends to generate anxiety leading many people to avoid situations requiring them to speak in public. As aversion to public speaking can differ among groups of individuals, it can contribute to the exclusion of some groups to lucrative careers. Existing evidence on gender differences in public speaking aversion is based on self-reported measures. We innovate by running a field experiment allowing us to analyze whether in an incentivized setting men and women show differences in their willingness to speak in public. The experiment involved about 520 undergraduate students who could gain some points to add to the final grade of their exam by presenting the results of a set of problems they had to solve. Students were randomly assigned to present in front of a large audience (a class of 100 or more) or only to the instructor. We find that while women are more willing to present face-to-face, they are considerably less likely to give a public presentation. We show that this tendency does not depend on differences in ability, risk-aversion, self-confidence and self-esteem.

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1. Introduction

Even if women's positions in many industrialized countries has changed over time and new generations experience nowadays a substantial gender equality in a number of spheres, gender inequality is still pervasive; moreover, the gender gap is larger at the top quantiles of the earning distribution suggesting that women tend to remain segregated in less paying jobs and positions. Piketty et al. (2016) show that the shares of women in the top 10%, top 1% and top 0.1% of the labour income distribution have been growing over time, but women's underrepresentation in top positions remains substantial. In addition, in recent years the progress has become much slower. For instance, in the US in 1970 5% of women had earnings that put them above the median of the similarly educated men's earnings distribution, this percentage has risen to 7% in 1980, 13% in 1990, 18% in 2000 and to 19% in 2010 (Bertand, 2019).[1] Similar evidence is found by Bar-Haim et al. (2018)[2], showing that in almost all investigated countries (Denmark, France, Finland, Germany, Italy, Israel, Luxemburg, Spain, Norway, Netherland, UK, US) there has been an increase in women representation in the top earnings deciles, but younger cohorts experienced a slower increase, and in some countries cohorts born after the 1960's did not experience a rise at all.

These differences are at least partially due to differences in study and career choices: women tend to prefer humanities and social sciences and to lag in the STEM fields. Little is known about the factors driving these differences, on whether they are the result of perfectly rational and efficient choices or if they are also somewhat due to barriers that prevent women from pursuing successful careers. The obstacles faced by women work subtly, since in some cases they originate from the different expectations that society and women themselves have on behaviors considered appropriate for them.

Past research has investigated gender differences in a number of psychological traits (Bertrand, 2011; Croson and Gneezy, 2009; Azmat and Petrongolo, 2014), which might be the result both of nature and nurture. A robust evidence shows that females are more averse to risk and less competitive, have a lower degree of self-confidence, suffer more under time pressure and from receiving negative feedbacks. These psychological differences may be responsible for a significant share of gender gaps in economic outcomes. High risk sectors are characterized by higher mean earnings; then, if women are more risk-averse than men, they will end up being overrepresented in jobs with lower mean and variance salaries. Similarly, high-profile careers develop in highly competitive contexts, if women tend to avoid this type of environment, they will hardly pursue those careers. These differences might also play a role in determining the field of study choice. For instance, women tend to avoid fields of study that are perceived as more competitive and challenging (Buser et al. 2014).

A less investigated gender difference, that is however an important prerequisite of many high-level careers, is represented by attitudes toward public speaking. Public speaking competence is described by

[1]Consistent figures are reported by Blau and Kahn (2017) who analyze the trend in the gender wage gap in the US between 1980 and 2010 and find evidence that it has declined more slowly at the top rather than at the bottom of the wage distribution.

[2]These authors use the Luxembourg Income Study (LIS) to investigate the evolution of the gender composition of the top earnings deciles for twelve countries over 25 years (cohorts going from 1930 to 1970).

many scholars as one of the determinants of personal success, a strategic skill to gain credibility, reputation and competitive advantage in the job market (Marinho et al., 2017). According to a recent survey conducted for the Association of American Colleges and Universities (AAC&U)[3], communication skills are essential for performing in business, academic and professional environments and the ability to speak competently in public is an important skill for employability and successful job performance.[4]

On the other hand, public speaking is often considered as an anxiety-generating factor that leads to fears that can negatively impact personal, academic and professional achievement. A number of psychological studies shows indeed that speaking in public is experienced as intensely stressful by many people. On the basis of these results in lab experiments speaking in front of others is commonly used as an intervention aimed at causing stress (Kirschbaum et al, 1993). There is also evidence of gender differences in self-reported public-speaking anxiety with women reporting higher levels of stress (Marinho et al., 2017). The most frequent outcome resulting from public speech anxiety is avoidance of speaking situations (McCroskey, 1997), which in turn can limit one's involvement and effectiveness in educational pursuits, career accomplishments, and community activities (Daly et al., 1997).

While psychological studies have widely focused on the anxiety deriving from public speaking and managerial literature has focused on the importance of public speaking for leadership and career, the economic literature has mainly neglected this theme. The aim of this paper is to try to fill this gap and offer evidence on factors affecting public speaking aversion. While the psychological literature relies on self-reported measures, our investigation is based on an experiment with an incentivized task. At this aim we have conducted a field experiment involving about 520 students attending 4 different courses offered by an Italian University. These students were given the possibility to gain some points to add to the final grade of the exam by solving at home a number of exercises/questions, submitting the solutions and accepting to present them orally either in front of the class or at the instructor during office hours. Students were randomly assigned either to the group "Class Presentation" who had to present the homework to the whole class and to the instructor or to the group "Presentation to the Instructor" who had to present the homework to the instructor during an office hour appositively defined. The assignment of students to the two groups and the questions composing the homework (both theoretical, numerical and graphical questions) were published on courses' web pages and students had two weeks of time to decide whether to join the experiment, by submitting the problem set solutions. Due to time constraints, we decided that only one third of students (randomly selected) submitting the solutions to the problem sets were required to present their homework. Students submitting their work but refusing to orally present (or absent the day of the presentation) if drawn were penalized with a reduction of two points.

[3]Hart Research Associates (2015).

[4]The importance of public speaking for individual success finds support on the large number of courses offered both by public and private organizations providing practical guidance for how to effectively speak in public (Zabava Ford and Wolvin, 1993; Gibson et al., 1985; Morreale et al., 2016;) and on how to manage the anxiety that comes with doing so (Menchhofer, 1938; Castillo, 2010; Robinson, 1997; Ayres and Schliesman, 2002; Bodie, 2010; Shanahan, 2013; Sanders, 2018).

We find that while women are more willing to present face-to-face to the instructor (participating on average 43%), they are considerably less likely to give a public presentation (25%), that is they participate 18 percentage points less if they are assigned to the public speaking. In contrast, men tend to participate less to face-to-face presentation (about 39%) but there is no difference in their propensity to participate if they are assigned to the public presentation. We show that this tendency does not depend on differences in ability, risk-aversion, self-confidence and self-esteem.

2. Experimental Design and Data

2.1. Design and procedure

We run a field experiment involving 525 students enrolled in the academic year 2018-2019 at four undergraduate courses at the University of Calabria: two courses of Principles of Economics, Microeconomics and Econometrics offered by a number of Degree programs.[5][6]

These courses were all compulsory and all of them were held during the second semester (from February to June). The two courses of Principles of Economics and the course of Econometrics are worth 9 credits corresponding to 63 hours of teaching and to a nominal 162 hours of study, while the course of Microeconomics is worth 12 credits corresponding to 84 hours of teaching and to a nominal 216 hours of study. For each course, all students attended the lectures in the same room, at the same time and with the same instructor and teaching material.

To enroll in the course, students were asked to fill out an on-line form and to complete a short survey on their family background, risk preferences, self-confidence and their self-esteem. The aim was that of collecting information on a number of individual characteristics that might drive selection and affect performance at the public speaking. Students were assured that their answers would not be considered for the evaluation of exam.

Before students completed the Survey we did not mention the experiment. Similarly, to avoid to affect their behavior, we did not mention at all the issue concerning public speaking and gender during teaching classes. Subsequently, after about two weeks of courses, we informed students that they have the possibility to obtain two extra points to add to the final grade of the exam by solving at home a number of exercises/questions, submit the solutions and accepting to present them orally either: a) in front of the class (plus the instructor); b) at the instructor during office hours. Typically, a class is composed by more than 100

[5]These courses were offered, respectively, by the First Level Degree in Law, the First Level Degree in Political Science, the First Level Degree in Economics and Second Level Degree Course in Business and Administration.

[6] The University of Calabria is a middle-sized public university located in the South of Italy. It has currently about 27,000 students enrolled in different Degree Courses and at different levels of the Italian University system. Since the 2001 reform, the Italian University system is organized into three main levels: First Level Degrees (3 years of legal duration), Second Level Degrees (2 further years) and Ph.D. Degrees. In order to gain a First Level Degree students have to acquire a total of 180 credits. Students who have acquired a First Level Degree can undertake a Second Level Degree (acquiring 120 more credits). After having accomplished their Second Level Degree, students can apply to enroll for a Ph.D.

students, with the exception of Econometrics which was attended by about 90 students. Once obtained the list of enrolled students in the course (in total 525), we proceeded to the stratification of students according to the following variables: course attended (Microeconomics, Principles of Economics in Law; Principles of Economics in Political Science; Econometrics); gender; High School Grade (divided in 4 quartiles). Then, students were randomly assigned to the "Presentation to the Class" or "Presentation to the Instructor". The procedure assigned 261 students to "Class Presentation" and 264 students to "Presentation to the Instructor". The list of students included in each group, were published on the course web page together with the homework to be completed (the problem set proposed to students within each course is available in the on-line Appendix). Students were given two weeks to choose whether to join the experiment, by submitting the problem set solutions. A total of 188 students (about 36% of the students enrolled in the courses) decided to submit the problem set solutions.

With the submission of the homework students agreed to present it orally to the class or to the instructor depending on the treatment group (one third of students submitting the homework were randomly drawn from each group). Students submitting their homework, regardless of whether they were drawn for the oral presentation, got a bonus of 2 points to be added to the final mark (unless it was clear that the homework was performed by someone else). On the other hand, students submitting their work and randomly drawn for the oral presentation who were absent the day of the presentation or who refused to present were penalized with a reduction of two points of the final mark obtained at the exam.

The presentations were scheduled one week after the submission of the problem set solution (with one day of difference between the two treatment groups). As the instructor presence was necessary both during the presentation to the class and during the office hours presentation, we decided to proceed organizing the presentation in two subsequent days. The first day, at the end of the teaching class, were communicated the names of the students randomly drawn for the presentation in front to the instructor. These students were required to immediately join the instructor in her/his office and present to her/him the work. The following day, at the beginning of the class, were communicated the names of students required to present to the class, then they were invited, following a random order, to present a part of the homework (following the order in which the problem set was presented to students).

All the rules of the experiment were explained to students and published on the courses' webpages (see Appendix A). All participant and non-participant students took the exam in the standard way, sitting at the end of the course with questions and exercises covering the whole course program evaluated with a maximum score of 30 points and a minimum passing score of 18.

3. The Data

3.1 Descriptive Statistics

We have data on 525 students enrolled at four undergraduate courses. Descriptive statistics are reported in Table 1. Our main dependent variable is *Participation*, a dummy equal to one if student *i* accepts to participate to the task of solving a problem set and to present it orally (and zero otherwise). On average, about 36% of students accept to participate, ranging from 20% in one first-year course to 60% in Econometrics.

As explained above, we randomly assign to students – stratifying for course, gender and High School Grade– our treatment variable *Public Presentation*, which is equal to one for students assigned to present in front of a public audience their work (and 0 otherwise). Half of the students have been assigned to *Public Presentation*.

From administrative data and from our survey we gather data on a number of individual characteristics. In our sample, 55% are women. The *High School Grade* (ranging in Italy from 60 to 100) is on average 83.9. About 58% attended a *Lyceum*. The mean *Age* is 20.3. 2% are non-Italians. *Parents' education* is on average 12.3 (years of schooling).

The *Self-Predicted Grade* in each respective course is 25.4.7*Risk Aversion* is a self-reported measure of risk aversion, on a scale from 1 (full availability to take any risk) to 10 (no willingness to take risks); the mean of Risk-Aversion is 4.7. *Self-esteem* is based on the answer from 1 to 10 to the question "How satisfied are of yourself?".

Finally, we use dummy courses: 38% of our sample students come from Microeconomics, 26% from Principles of Economics (Degree in Law), 19% from Principles of Economics (Degree in Political Sciences), 16% from Econometrics.

[7] In the Italian University system, grade at exam ranges from 18 to 30 cum laude (which we codify as 31).

Table 1. Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	Obs
Participation	0.358	0.480	0	1	525
Public presentation	0.497	0.500	0	1	525
Female	0.556	0.497	0	1	525
High School Grade	83.870	10.626	60	100	509
Lyceum	0.585	0.493	0	1	509
Age	20.264	2.865	18	53	511
Non-Italian	0.021	0.143	0	1	525
Parents' Education	12.318	3.207	3	18	520
Self-Predicted Grade	25.381	2.433	18	31	520
Risk-Aversion	4.681	1.964	1	10	520
Self-esteem	7.188	1.871	1	10	520
Econometrics	0.164	0.370	0	1	525
Principles of Ec. (Law)	0.257	0.437	0	1	525
Principles of Ec. (Pol.Sc.)	0.194	0.396	0	1	525
Microeconomics	0.385	0.487	0	1	525

3.2. Balance Checks

Preliminarily, we check if the randomization has been successful in creating comparabletreatment and control groups along a number of observable characteristics.

In Table 2 we regress a number of pre-determined characteristics – in turn – on our treatment variable *Public Presentation*. Therefore, the coefficient on *Public Presentation* indicates if a given characteristic is different in the treatment group with respect to the control group (whose mean is indicated by the constant). For example, in column (1) we see that 56.8% of females are in the control group while are 2 percentage points less in the treatment group. The differences is far from statistical significance.

In all the columns – considering, respectively, Female, High School Grade, Lyceum, Age, Parents' Education, Self-Predicted Grade, Risk-Aversion, Non-Italian – wefail to reject the null hypothesis that there are no significant difference between treatment and control group.

We have also run the same regressions controlling for course dummies (since randomization occurred at the course level) and we find very similar results (not reported).

Table 2. Balance Checks

	(1) Female	(2) High School Grade	(3) Lyceum	(4) Age	(5) Parents' Education	(6) Self-Predicted Grade	(7) Risk-Aversion	(8) Non-Italian
Public Presentation	-0.024	-0.148	0.028	-0.120	0.340	0.085	-0.038	0.004
	(0.043)	(0.942)	(0.044)	(0.254)	(0.281)	(0.214)	(0.172)	(0.013)
Constant	0.568***	83.976***	0.573***	20.320***	12.148***	25.338***	4.700	0.019**
	(0.031)	(0.682)	(0.031)	(0.170)	(0.194)	(0.149)	(0.120)	(0.008)
Observations	525	508	508	510	520	520	520	525
$R^{23.2}$	0.001	0.000	0.001	0.000	0.003	0.000	0.000	0.000

Notes: OLS estimates. The dependent variable is reported on the top of each column. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

4. The Empirical Analysis: Gender and Public Presentation

In this Section we carry out an econometric analysis to investigate if being assigned to the public presentation leads students to participate less to the proposed task, and if this propensity depends on gender.

In Table 3 a Linear Probability Model for the probability of participate, taking into account the assigned treatment condition. In column (1) we focus only on women while in column (2) we consider men. The main findings of our experiment can be shown in these two columns. We find that women participate on average 42.7% if assigned to face-to-face presentation, whereas participate 18 percentage points less if assigned to the public presentation (24.7%). The difference is highly statistically significant (*t*-stat=-3.31). In contrast, men tend to participate less to face-to-face presentation (38.6%) but there is no difference in their propensity to participate if they are assigned to the public presentation.

In column (3) we estimate on the whole sample of men and women and use an interaction term between *Female* and *Public Presentation*. We confirm that women tend to participate more than men if assigned to face-to-face presentation (4.1 p.p. more, but not statistically significant), but women are 17.2 p.p. less likely than men to participate if assigned to public presentation (*t*-stat=-2.05).

Since the propensity to participate could well depend on student's academic ability and in our sample men and women tend to differ in terms of abilities, we run the same regression of column (3)but we control for *High School Grade*, an important measure of ability (see, among others, De Paola and Scoppa, XXXX). We find that 10 points more of High School increase the propensity to participate of 9 p.p. More importantly, the difference between men and women in the propensity to do a public presentation is almost unchanged (16.4 p.p.).

In column (5) we control for course dummies, leaving Microeconomics as the reference category. Since among courses there are relevant differences in terms of abilities and age, one expects that these affect the rate of participation. In fact, Econometrics' students participate much more (+23 p.p.), while students from Law and Political Sciences participate much less(about -15 p.p.). Nonetheless, the different propensity to speak in front of an audience among men and women is confirmed (16.2 p.p.).

Table 3. Public Presentation and Gender. OLS Estimates

	(1)	(2)	(3)	(4)	(5)
Public Presentation	-0.180***	-0.008	-0.008	-0.021	-0.016
	(0.054)	(0.064)	(0.064)	(0.064)	(0.062)
Female			0.041	0.006	0.026
			(0.061)	(0.062)	(0.062)
Female*(Public Presentation)			-0.172**	-0.164*	-0.162**
			(0.084)	(0.084)	(0.081)
High School Grade				0.009***	0.008***
				(0.002)	(0.002)
Econometrics					0.235***
					(0.064)
Principles of Ec. (Law)					-0.162***
					(0.054)
Principles of Ec. (Pol.Sc.)					-0.144***
					(0.054)
Constant	0.427***	0.386***	0.386***	-0.310*	-0.253
	(0.041)	(0.046)	(0.046)	(0.163)	(0.171)
Observations	292	233	525	509	509
R^2	0.036	0.000	0.022	0.059	0.139

Notes: OLS estimates (Linear Probability Model). The dependent variable is *Participation*. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

In Table 4, we investigate if the gender difference in the propensity to present publicly is driven by some individual characteristics or by some psychological trait. In column (1) of Table 4, in addition to the High School grade we control for the type of High School attended (*Lyceum*) and for students'*Age*. We find that Lyceum's students tend to participate much more (+12.3 p.p.) while age – once controlling for course dummies – does not affect the propensity to participate. In column (2) we control for *Parents' Education* and *Non-Italian*. We find that the education of parents has no effect on our dependent variable, while *Non-Italians* are much less willing to present (-18.3 p.p.).

Some psychological traits – the degree of self-confidence, risk-aversion and self-esteem – that tend to be different between men and women[8] could drive our main results. To consider these aspects, starting from column (3) we additionally control for the *Self-Predicted Grade* at the exam and for the Predicted Relative Grade (equal to 0 if a student thinks to obtain a grade equal to the average grade in the class, equal to 1 if a student think to obtain a better grade, and equal to -1 if a student think to obtain a worse grade). These are measures of both ability and self-confidence. The *Self-Predicted Grade* has a strong positive effect on the propensity to participate while the Predicted Relative Grade has a positive but not significant effect. However, the interaction term *Female*(Public Presentation)* is almost the same (-15.4 p.p.).

In column (4) we control for the degree of *Risk Aversion*. We find a negative although not significant effect of this variable on the propensity to participate, but again our interaction term remain similar (-16 p.p.).

[8] See Croson and Gneezy (2009), Bertrand (2001).

Finally, in column (5) we control for a measure of *Self-esteem*. This variable seems to have no effect on the probability to participate and does not affect our coefficient of interest.

Table 4. Public Presentation and Gender: Controlling for Self-confidence, Risk-Aversion, Self-esteem. OLS Estimates

	(1)	(2)	(3)	(4)	(5)
Public Presentation	-0.020	-0.020	-0.023	-0.021	-0.020
	(0.062)	(0.062)	(0.061)	(0.060)	(0.061)
Female	0.026	0.026	0.043	0.049	0.049
	(0.062)	(0.062)	(0.062)	(0.062)	(0.063)
Female*(Public Presentation)	-0.159**	-0.159**	-0.154*	-0.160**	-0.160**
	(0.080)	(0.080)	(0.080)	(0.080)	(0.080)
High School Grade	0.008***	0.008***	0.007***	0.007***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Age	-0.000	0.000	-0.001	-0.002	-0.002
	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)
Lyceum	0.123***	0.121***	0.115***	0.115***	0.115***
	(0.041)	(0.042)	(0.041)	(0.041)	(0.041)
Econometrics	0.224***	0.224***	0.203***	0.201***	0.200***
	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)
Principles of Ec. (Law)	-0.184***	-0.187***	-0.193***	-0.198***	-0.198***
	(0.054)	(0.054)	(0.055)	(0.055)	(0.055)
Principles of Ec. (Pol.Sc.)	-0.131**	-0.133**	-0.117**	-0.122**	-0.123**
	(0.053)	(0.054)	(0.053)	(0.053)	(0.054)
Parents' Education		0.002	-0.001	-0.001	-0.001
		(0.007)	(0.007)	(0.007)	(0.007)
Non-Italian		-0.183*	-0.173*	-0.145	-0.144
		(0.099)	(0.101)	(0.100)	(0.103)
Self-Predicted Grade			0.024***	0.023**	0.023**
			(0.009)	(0.009)	(0.009)
Predicted Relative Grade			0.063	0.057	0.057
			(0.059)	(0.059)	(0.060)
Risk-Aversion				-0.014	-0.014
				(0.010)	(0.010)
Self-esteem					0.001
					(0.011)
Constant	-0.332	-0.349	-0.813***	-0.746**	-0.749**
	(0.221)	(0.230)	(0.294)	(0.298)	(0.297)
Observations	509	509	509	509	509
R^2	0.155	0.157	0.180	0.183	0.183

Notes: OLS estimates (Linear Probability Model). The dependent variable is *Participation*. Standard errors (corrected for heteroskedasticity) are reported in parentheses. The symbols ***, **, * indicate that the coefficients are statistically significant at the 1, 5 and 10 percent level, respectively.

5. Concluding Remarks

A number of psychological traits – such as risk aversion, willingness to compete, aversion to feedbacks – have been recently identified as relevant in contributing to explain gender differences in occupations, wages and careers.

Public speaking is generally thought to be relevant for career growth and leadership positions. The ability to present information publicly, clearly and eloquently gives an important competitive advantage in a variety of job settings (Fallows and Steven 2000). While giving individuals valuable opportunities, speaking to a public is also a possible source of embarrassment and criticism. Little is known on factors affecting neither the willingness to face public speaking situations nor the ability to deal with the stress deriving from this type of exposure to judgment and to be effective in public speech. Men and women could differ in the anxiety generated by public speaking and therefore be differently averse to public speaking. This in turn could cause gender differences in career perspectives and access to top positions.

Existing evidence on gender differences in public speaking aversion is based on self-reported measures. In this paper we innovate by running a field experiment allowing us to analyze whether in an incentivized setting men and women show differences in their willingness to speak in public. The experiment involved about 520 undergraduate students who could gain some points to add to the final grade of their exam by presenting the results of a set of problems they had to solve. Students were randomly assigned to present in front of a large audience (a class of 150 or more students + the instructor) or only to the instructor.

We find huge differences among men and women in their willingness to present in public. While women are more willing to present face-to-face, they are considerably less likely to give a public presentation. We show that this tendency does not depend on differences in ability, risk-aversion, self-confidence and self-esteem.

The uncovered aversion of women to speak in public could be a relevant factor in explaining the gender differences on the labor market in access to high-level positions and career growth.

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Appendix A. Instructions to students

In this academic year students attending this course have the possibility to gain a bonus of 2 points to be added to the final grade, by doing a homework consisting in solving a set of questions/exercises.
The questions involving both theoretical reasoning and numerical and graphical analysis will be published on the course web page and students will have two weeks of time to solve them and submit them to the instructor.
One third of students who have submitted their homework will be randomly drawn to present their work either in front of the class or to the instructor during office hours. The modality of the presentation depends on whether the student has been randomly allocated to one of the following groups:

1. "Presentation to the Instructor": students included in this group will have to present some of the exercises/questions included in the homework during the instructor office hours;
2. "Presentation to the Class": students included in this group will have to present some of the exercises/questions in the classroom in front of the whole class.

The list of students included in each group (randomly extracted) will be published on the course web page together with the problem set that has to be completed. By submitting the solutions (within 2 week of time), students agree to orally present part of the homework. The presentation is planned seven days after the submission of solutions to the problem set. One third of students in each group who have submitted the homework will be randomly drawn for the presentation. Students submitting their work will obtain two extra points to add to the final grade exam, regardless of the fact that they have been drawn to do the presentation. For presenters, the bonus is independent on the quality of the presentation at least it is not obviously clear that the homework has been performed by someone else. Students, submitting their work and randomly drawn for the oral presentation who will be absent the day of the presentation or who will refuse to present will be penalized with a reduction of two points of the final mark obtained at the exam.

Presentations will be organized in two subsequent days. The first day, at the end of the teaching class, the names of the students randomly drawn for the presentation in front to the instructor will be communicated. These students will be required to immediately join the instructor in her/his office and present to her/him the work. The following day, at the beginning of the class, students will be informed about who is randomly drawn to present to the class, these students will be invited, following a random order, to present a part of the homework (following the order in which the problem set was organized).

Participation to the homework is not compulsory, students are completely free to join it (according to the rules written above) or to not participate. All participant and non-participant students will take the exam in the standard way, sitting at the end of the course with questions and exercises covering the whole course program evaluated with a maximum score of 30 points and a minimum passing score of 18