INNODOCT/16

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EDITORIAL
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Colección Congresos

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PROLOGUE

It is a pleasure for me, as Dean of the Escuela Técnica Superior de Ingenieros Industriales (School of Industrial Engineering) de la Universidad Politécnica de Valencia, to write the prologue to this resume of the proceedings of INNODOCT 2016 (International Conference on Innovation, Documentation and Teaching Technologies), which took place in Valencia in May 2016 under the slogan Lean Education & Innovation.

We can confidently confirm that these initiatives help professors to show and share experiences related to the application of new trends in education and the utilization of new technologies.

Lean in Education is the adaptation of lean thinking to Higher Education both in administration and academic activities. Pioneering academic institutions include: Edinburgh Napier University (Scotland), Cardiff University (Wales), Michigan Technological University (USA), University of Central Oklahoma (USA) and others. These universities are working within the area of continuous improvement, the use of best practices. The respect for people principle is required in order to sustain continuous improvement.

The Universidad Politécnica de Valencia is immersed in this process and, like other Spanish and European universities, is undergoing a profound transformation that requires great effort from all involved.

For these reasons, initiatives like INNODOCT 2016 are a great help in generating awareness of change and in showing different points of view that without doubt enrich the debate.

We encourage the organizers to persevere along this line safe in the knowledge that the Escuela Técnica Superior de Ingenieros Industriales will be alongside them offering support.

Jorge García-Serra García
Dean of School of Industrial Engineering
Director de la Escuela Técnica Superior de Ingenieros Industriales
Universitat Politècnica de Valencia

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UNIVERSITAT POLITÈCNICA DE VALÈNCIA

ENGLISH

Managing and Assessing Team Projects in Econometrics

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Abstract

In the context of Economics and Business degrees, Econometrics provide a wide variety of tools which appear to be narrowly related to several main competences such as information management, creativity, problem solving or decision-making. Furthermore, the need of analyzing and interpreting the functioning of the economy suggests the convenience of learning Econometrics by doing Econometrics.

Team projects can play a main role in the teaching-learning process, since they allow students cooperating in the development of econometric models, taking benefit from econometric software and ICT facillities, and also improving their ability to work in team, as suggested by employers. Moreover, from the teachers´ perspective, the development of team projects represents a good opportunity to re-think some methodological aspects, also opening new challenges in the management and assessment of the projects.

In this paper we summarize our experiences in supervising Econometrics team projects for more than a decade, describing the main pedagogical and organizational decisions. According to the available information (based both on objective statistics and online students´ surveys) we confirm some strengths of the experience (such as the use of Gretl, the virtual campus, the continuous assessment or the oral presentation) but also some weaknesses, mainly referred to organizational aspects and the improvement of critical and self-critical ability.

Keywords: *Team Project, Econometrics, Gretl, Self-assessment, Peer-assessment, Surveys*

Resumen

En el marco de los actuales planes de estudios de Economía y Empresa, las asignaturas de Econometría propocionan una amplia variedad de herramien-

tas estrechamente relacionadas con competencias como el manejo de información, la creatividad, la resolución de problemas o la adopción de decisions. En este contexto, la necesidad de analizar e interpreter el funcionamiento de la economía sugiere la conveniencia de aprender Econometria haciendo Econometría.

Los trabajos en equipo pueden desempeñar un papel fundamental en el proceso de enseñanza-aprendizaje dado que permiten a los estudiantes colaboarar en el desarrollo de modelos econométricos, beneficiándose del uso del software Gretl y las nuevas tecnologías y mejorando sus habilidades para el trabajo cooperative tal y como demandan los empleadores. Además, desde la perspectiva de los profesores, la implementación de trabajos en equipo representa una buena oportunidad para reflexionar sobre aspectos metodológicos y abre nuevos desafíos relativos al seguimiento y la evaluación de estos trabajos.

En este trabajo resumimos nuestras experiencias desarrolladas durante más de una década y describimos las principales decisiones docentes y organizativas. La información disponible (que procede tanto de estadísticas objetivas como de encuestas realizadas a alumnos) confirma algunas de las principales fortalezas de la experiencia (como el uso de Gretl, el campus virtual la evaluación continua o las presentaciones orales) y también algunas debilidades, referidas principalmente a los aspectos organizativos y las competencias relacionadas con la capacidad crítica y autocrítica.

Palabras clave: *Trabajo en equipo, Econometría, Gretl, Autoevaluación, Evaluación por pares, Encuestas.*

Introduction

Econometrics provide a wide variety of tools which help students analyze and interpret the functioning of the economy. In fact, these tools appear to be narrowly related to several main instrumental competences (such as information management, problem solving or decision-making) but also interpersonal competences (critical and self-critical capability, team capability) and systemic competences (learning capability, creativity, concern for quality and good work).

Team projects can play a main role in the teaching-learning process, since they allow students cooperating in the development of econometric models, taking benefit from econometric

software and ICT facilities, and also improving their ability to solve problems and work in team, as demanded by employers.[1]

From the teachers´ perspective, the development of team projects represents a good opportunity to re-think some methodological aspects, also opening new challenges in the assessment of students, particularly regarding their collaborative activities.

In this paper we describe our experiences in managing and assessing Econometrics team projects for more than a decade, describing the main pedagogical and organizational decisions and summarizing some empirical results.

With this aim, section two presents the academic framework, describing the methodology and mainly focusing on the software Gretl and the team projects. Afterwords, section three analyzes the management and assessment of these projects from teachers´ and students´perspective, proposing a straightforward methodology that includes peer and self assessment.

Section four summarizes the main empirical findings, testing the consistency of students´ answers and analyzing the adequacy of the proposed assessment system. The paper finishes with some concluding remarks.

Teaching-Learning Process in Econometrics

The degree of Economics aims training individuals capable of analyzing and interpreting the functioning of the economy, and includes Econometrics as a compulsory third-year subject with about 100 students divided into two groups for theoretical sessions, three groups for classroom practices and five grous for lab sessions. Within this framework, our blended learning experiences in Econometrics at the University of Oviedo started sixteen years ago, when the virtual campus AulaNet was created, and since then the methodology has been progressively adapted to new technological resources (virtual campus platforms, econometric software, …) and new university degrees in the context of the European Higher Education Area (EHEA), as described in López & Pérez (2011).

Our teaching-learning experiences have tried to be coherent with the student-centered learning approach and therefore main efforts have been made with the aim of crossing borders

1 The development of the European Higher Education Area (EHEA) emphasized the need to adapt students' knowledge and capacities to the labour market requirements. According to two large scale surveys implemented in the framework of the European Project "Tuning Educational Structures in Europe", employers, students, graduates and academics agree in ranking in the first positions the competence"Ability to apply knowledge in practical situations". Nevertheless, employers and students also give a high priority to the competence "ability to work in team" (fifth place) while academics rank this competence in the eleventh position.

between "learning Econometrics" and "doing Econometrics". Table 1 provides an overview of the learning resources and the related competences.

Table 1. Econometrics Learning Resources and Competences

Learning Resources	**Description**	**Competences**
Theoretical Sessions	2 h/week (groups of 50 students). Learning materials on virtual campus.	Ability for abstract thinking, analysis and reasoning, Capacity to learn and to stay up-to-date with learning.
Practical Sessions in Classroom	1 h/week (groups of 25 students). Solved and proposed problems on virtual campus.	Ability to apply knowledge in practical situations, Ability to identify, pose and solve problems.
Lab Sessions with Gretl	1 h/week (groups of 15 students). Workfiles available online	Skills in the use of Information and Communication Technologies, Ability to communicate in a second language, Ability to make reasoned decisions.
Team Project with Gretl	Groups of 3-4 students. Project proposal. Oral exposition. Online forum and tutorials. Final report.	Capacity to generate new ideas (creativity), Ability to be critical or self-critical, Ability to communicate both orally and in writing in native language, Ability to search for, process and analyse information from a variety of sources, Ability to undertake research at an appropriate level, Ability to work in a team, Interpersonal and interaction skills, Ability to plan and manage time, Ability to act on the basis of ethical reasoning.
Assessment	Continuous assessment, Team Project self and peer assessment, Final exam	Knowledge & understanding of the subject area, Ability to work autonomously

Source: Adapted from López & Pérez (2011)

The application of the described methodology leads to quite satisfactory results, according to both objective and subjective indicators. Regarding the rate of efficiency (computed as the ratio between passed and registrered credits), the Econometrics results exceed the average figures of the Deparment of Applied Economics and the School of Economics and Business and similar conclusions are found with regard to the rate of expectancy (examined/registered), the rate of success (passed/examined) and the proportion of students achieving high marks[2].

[2] The last figures, referred to academic year 2014/2015 provide a rate of efficiency of 58.2%, which can be obtained as the product of the rate of expectancy (86.7%) by the the rate success (67.1%).

With regard to the subjective indicators, students´ online surveys detect a high level of agreement with the achieved competences and skills, especially those referred to information management, computing and problem solving. Teamwork is also appreciated as a valuable although rather hard competence.

Three elements must be highlighted as determinants of this success: the advantages of the software Gretl, the role of the Team Project and the adequacy of the assessment system.

Gretl (Gnu Regression, Econometrics and Time-series Library) has proved to be a suitable software for educational purposes, as shown in the works by Baiocchi & Distaso (2003), Mixon & Smith (2006), Yalta & Yalta (2007), Rosembladt (2008), Cottrell (2009), Falat & Panciková (2012), Cottrell & Luchetti (2014) and Adkins (2014), among others. In a recent work [López & Pérez (2015)] we have implemented the "Four-F" test including the hypotheses of Freedom, Flexibility, Functionality and Friendliness, finding that –according to both objective evidence and students´ subjective perceptions- Gretl clearly fullfils the requirements of freedom, flexibility and friendliness, while some difficulties arise with regard to its functionality.

Team project is considered as a key point in the Econometrics learning process, providing our students with many competences. Since the management and assessment of these projects are the main goal of this paper, they are analyzed in more detail in the next section.

Finally, the assessment system has been designed by combining the continuous evaluation and the final exam. More specifically, according to this procedure the team project has a weight of 25%, while the final exam weights 60% and the remaining 15% corresponds to monthly assesment questions, collected in theoretical, practical and lab sessions. With the aim of rewarding students who regularly attend class, the continuous assessment grade is computed as the average of each student´s four best scores, thus providing some extra "degrees of freedom".

Managing and Assessing Team Projects

The inclusion of collaborative works into university courses is wide spread. In our case, as we have previously described, the team project plays an outstading role in the teaching-leaning process, since it provides our students with the opportunity to work with real information, thus becoming familiar with the main problems of econometric modeling and forecasting.

The management and assessment of these team projects are challenging from both teachers´ and students´perspectives. Although Information and Communication Technologies can be a

great help in managing these projects, teachers undoubtedly assume an extra-effort and the need to develop new assessment procedures.

Moreover, students undertaking such projects need advice and support and they often express concern about the way in which marks are allocated to different members of the group, with different contributions to the project.

As described in table 2, our methodology is based on an intensive use of the virtual campus resources from the very beginning of the process. Once the course is started, students are asked to submit online their proposals, allowing them to freely choose both teammates and topic.

Since then, all communications referred to team projects are channeled through the corresponding forum (with 3-4 team members and the professors) starting with the feedback to the first proposal and finishing by sending the final report (together with the corresponding Gretl workfiles). Of course, students have free access to the software Gretl and a wide variety of online materials, and they are also welcome to face-to-face tutorials, but the use of the team forum provides outstanding advantages throughout the entire process: students can easily organize themselves, ask and solve questions, … while teachers have access to extremely useful information in order to evaluate not only the final result, but also the learning process.

With the aim of sharing experiences, oral presentations of the team projects are scheduled along the semester and, since they take place at different development stages, further debate is emphasized, trying to develop critical and self-critical abilities.

Table 2. Team Project Monitoring and Assessment

Week	Activity and Monitoring	Assessment (weight)
2-3	Team and Project Proposal (online)	Grade assigned to project proposal (10%)
4	Team´ Forum Available, Feedback to first proposal, List of Projects Published	Forum Activity (10%)
4-14	Team Questionnaire and Oral Presentations	Grade assigned to presentation (30%)
Final exam	Final report (forum)	Grade assigned to final report (50%)
Final exam	Personal Questionaire (including self-assessment and peer-assessment)	Final grade assigned to team and members

Source: Own elaboration

Regarding the assessment, we have faced two main difficulties, referred to the aspects of the team project that should be assessed (the product and/or the process) and the assignment of a mark to each member of the group. With respect to the first aspect, we aim to evaluate not

only the product (the final report weights 50%) but also the process, which is rather more difficult, (weights of 10% are assigned to the initial proposal and forum activity while oral presentation weights 30%).

With reference to the criteria of assigning marks to different members of a group, the most simple option according to which all members of the group receive the same mark seems to be quite unfair when –as it is often the case- they do not contribute equally to the project.

In order to solve this problem, marks should be assigned to each member of the team according to their relative contributions, and the use of peer assessment is an interesting way for doing this. Since many academics have developed a variety of mechanism of peer assessment, sometimes combined with self-assessment and co-assessment, with different degrees of complexity[3], in this paper we propose a straightforward approach according to which each student evaluates each member of the team, and also the team as a whole, using the standard scale from 0 to 10. In this way students are familiar with the grading system, hopefully increasing the accuracy of their answers, and the obtained results are fully homogeneous and comparable.

More specifically, according to our proposal and denoting the marks provided by teachers and students by X and Y respectively, the final grade assigned to a student i of a team t can be computed as follows:

$$X_{i,t} = \left(X_t^{\text{Proposal}} 10\% + X_t^{Forum} 10\% + X_t^{\text{Presentation}} 30\% + X_t^{\text{Report}} 50\% \right) \frac{\overline{Y}_{i,t}}{\overline{Y}_t} \qquad (1)$$

where $\overline{Y}_{i,t}$ and $\overline{Y}_t$ represent the average grades assigned to student i and team t by all the team members.

In the next section we summarize the empirical results obtained with this procedure, testing the consistency of students´ answers and analyzing the system adequacy in order to achieve a better assessment.

3 Some proposals are based on the direct use of a standard grading scale while others require an assessment of the contribution of the other team members by allocating each a score out of 100. As explained by Kennedy (2005), according to this 'constant sum game' it is possible for a student to score over 100% if both their contribution and the group mark are very high.

Empirical Findings

Our experience provides interesting empirical evidence referred to three different aspects: consistency of the peer assessment results, consistency between self and peer assessment and impact of the assessment system on students´ grades.

The available information comes from teachers´ records and individual questionnaires provided by a total of 88 students grouped in 24 teams[4], allowing a wide variety of statistical analyses.

With reference to the consistency, table 3 collects the mean and standard deviation of the peer assessment grades (columns two and three), together with the same measures for the grades assigned to the team as a whole (columns four and five).

4 Although the initial number of teams was 26, two of then where excluded since their members either did not attend the examen or did not answer the required questionnaire.

Table 3. Descriptive Statistics for Peer Assessment Grades

	Grades assigned to each team member		Grades assigned to the team	
Team	Mean	STD	Mean	STD
1	6.3	1.4	6.5	0.7
2	6.8	1.6	7.2	1.6
3	9.1	0.3	9.0	0.0
4	8.3	1.4	8.3	1.2
5	7.5	1.7	7.5	0.0
6	8.2	1.4	8.2	1.6
7	6.8	0.3	6.8	0.4
8	7.3	1.4	7.4	1.1
9	9.0	1.5	9.0	1.7
10	7.4	1.2	7.5	1.3
11	8.0	1.1	8.0	0.8
12	9.1	1.5	8.7	1.5
13	7.3	0.7	7.7	1.2
14	9.3	0.5	9.5	0.5
15	8.1	0.3	8.0	0.0
16	7.6	1.1	7.8	0.4
17	5.7	2.1	5.8	1.1
18	6.0	4.2	8.0	1.4
19	7.6	0.7	7.6	1.0
20	9.0	0.8	9.0	0.7
21	8.0	1.5	8.1	1.1
22	7.5	0.5	7.5	0.7
23	8.3	0.7	8.5	0.0
24	8.4	0.9	9.0	1.0

Source: Own elaboration

According to this information students are able to discriminate between student grades, instead of awarding equal marks[5]. However, the levels of dispersion are found to be moderate with the exception of group 18, where the mean grade is considered non-representative.

As expected, the dispersion between team members negatively affects the results of the group, as shown by the correlation coefficient between standard deviation and mean (-0.49). Furthermore, it can be seen that the average grade awarded to the team is in most of the cases (62.5%) higher than the one obtained from individual grades, thus suggesting the existence of a positive "team effect" which can be interpreted as the "team value added".

A more detailed analysis of the individual answers detects a high level of coherence between members of the same team, since the peer assessments to a given member of the team are found to be quite similar. In fact, the Pearson Variation Coefficient results to be low in the vast majority of the cases (97.7%) confirming the representativity of the mean peer-assessment[6].

In order to examine the consistency between self and peer-assessment, we have computed both absolute and relative self-assessment biases[7], whose expressions are collected in table 4. The obtained results support in both cases the consistency hypothesis, since the differences between self and peer-assessment for a given student are found to be non significant.

Table 4 Consistency between Self- and Peer-assessment

	Expression	Consistency Hypothesis	p-value
Absolute bias	$AB = Y^{Self} - Y^{Peer}$	$H_0 : \mu_{AB} = 0$	p=0.82
Relative bias (SAPA)	$RB = \frac{Y^{Self}}{Y^{Peer}}$	$H_0 : \mu_{RB} = 1$	p=0.69

Source: Own elaboration

5 Some authors suggest that students feel under pressure to award identical marks to their colleagues for friendship or reciprocity. Obviously, under this hypothesis peer assessment would not be helpful in discriminating between student grades.

6 More specifically, 54.8% of the cases provide a variation coefficient lower than 0.1, while 42.8% of the results take values between 0.1 and 0.4 and only the remaining 2.4% are higher than 0.4 and therefore detecting non-representative mean values of the peer-assessment grades.

7 The relative bias is also known as Self to Peer Assessment ratio (SPA), and this factor is sometimes used as a weighting factor used to change a team mark for an assessment task into an individual mark.

Finally we briefly examine the impact of the proposed assessment system on students´ grades. As expected, the team project final mark awarded to each student through expression (1) is usually lower than both the self-assessment and the peer-assessment grades, as it can be observed though the Self-Assessment to Teacher-Assessment (SATA) and the Peer-Assessment to Teacher-Assessment (PATA) ratios. The obtained results –summarized in table 5- are in both cases clearly significant, leading to the rejection of the unbiasedness hypotheses[8].

Table 5 Self- and Peer-assessment unbiadness tests

	Expression	Consistency Hypothesis	p-value
SATA	$SATA = \frac{Y^{Self}}{Y^{Teacher}}$	$H_0 : \mu_{SATA} = 1$	p=0.00
PATA	$PATA = \frac{Y^{Peer}}{Y^{Teacher}}$	$H_0 : \mu_{PATA} = 1$	p=0.00

Source: Own elaboration

In spite of the existence of the previously detected biases, self- and peer-assessments result to be significant in explaining the team project final mark awarded to each student. In fact, the following least-squares model has been fitted, also confirming the negative impact of the group dispersion and providing a coefficient of determination of 47%.

$$\hat{X} = \underset{(1.05)}{-0.671} + \underset{(0.12)}{0.643} Y^{Peer} + \underset{(0.11)}{0.243} Y^{Self} - \underset{(0.25)}{0.494} STD_Y \qquad (2)$$

This regression provides new interesting evidence about the relationships between teachers´ and students´ assessments, since the estimated parameters show the expected signs and they fail to reject the hypothesis $H_0 : \beta_1 = 0, \beta_2 + \beta_3 = 1$, thus confirming the adequacy of the proposed assessment procedure.

[8] Te consideration of absolute biases leads to similar conclusions, leading to the rejection of the proposed hypothesis of null mean absolute bias.

Concluding Remarks

The management and assessment of team projects are challenging from both teachers´ and students´ perspectives, requiring extra-efforts and new procedures. In this paper we have described our experiences in managing and assessing Econometrics team projects, that have provided quite satisfactory results, according to both objective and subjective indicators.

The proposed methodology is based on an intensive use of the virtual campus resources from the first team project proposal until the final report, also including the oral presentation and the forum debate. Regarding the assessment, we aim to evaluate both the product and the process, and include self- and peer assessment in order to estimate the relative contribution of different members of a group.

According to the available empirical evidence, collected from 88 students grouped in 24 teams, some interesting facts can be observed, referred to the consistency of the peer assessment results, the consistency between self and peer assessment and the impact of the assessment system on students´ grades.

First, with regard to the consistency of the peer assessment results the available information confirms students´ ability to discriminate, also showing a negative effect of the dispersion between team members on the mean group result.

Furthermore, the comparison between the average grade awarded to the team and the one obtained from individual grades confirms the existence of a positive "team effect" while the analysis of the individual answers detects a high level of coherence between members of the same team.

The consistency between self and peer-assessments has been analyzed through the absolute and relative self-assessment biases. In both cases differences are found to be non significant, thus failing to reject the consistency hypotheses.

As expected, these conclusions substantially change when the comparison of self- and peer-assessment refers to the team project final mark awarded to each student. In this case, the obtained results lead to the rejection of the unbiasedness hypotheses, but nevertheless our results confirm the significant positive effect of self- and peer-assessments, as explanatory factors of the final grade awarded to each student, while the team dispersion shows a negative significant effect.

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