

Assessment report
Limited Programme Assessment

Bachelor Econometrics and Operations Research

Erasmus University Rotterdam

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1. Executive summary

In this executive summary, the panel presents the main considerations which have led to the assessment of the quality of the programme Bachelor Econometrics and Operations Research of Erasmus University Rotterdam, which has been assessed according to the NVAO Assessment Framework.

The panel observes programme management has taken a wide range of measures in response to the recommendations made in the previous external assessment in 2009 and in the internal evaluation in 2012. Programme management has, among others, revised the intended learning outcomes, intensified study guidance, introduced more variation in examination methods and redesigned the Examination Board responsibilities.

The panel regards the programme to be focused on teaching students the fundamentals of econometrics and operations research, and more advanced knowledge in one of the sub-disciplines. The programme objectives are to train students thoroughly in econometrics and the constituting disciplines of economics, mathematics and statistics and in the application of mathematical and statistical methods and techniques to model economic reality and solve economic problems. The panel welcomes the two tracks of the programme, allowing students to opt for education in Dutch or in English. The major specialisations enable students to prepare for master specialisations of Erasmus School of Economics or programmes of other institutions. The panel is equally positive about the double degree programme, since this offers students the opportunity to complete both the Bachelor Econometrics and Bachelor Economics programmes in only four years.

The programme intended learning outcomes meet the programme objectives, exhibiting, among others, disciplinary knowledge and understanding of econometrics and mathematical decision-making, research competencies, analytical and problem-solving skills and professional skills. In the panel's opinion, the learning outcomes are consistent with the domain-specific reference framework, which was drafted by Erasmus School of Economics and the economics programmes of Vrije Universiteit Amsterdam and of Wageningen University, and correspond to the bachelor level programme requirements. The panel considers the programme learning outcomes to adequately prepare students for master programmes in this domain as well as for junior positions in the labour market.

The panel feels the involvement of the professional field through the Advisory Boards of the Erasmus School of Economics master programmes is satisfactory, as the School's programme management will direct relevant recommendations to this bachelor programme.

The admission requirements and processes, such as the study check procedures, are adequate. The emphasis on mathematical skills is for this programme very appropriate for admission.

The curriculum reflects the programme intended learning outcomes adequately. The curriculum is very well designed, coherent and effective in teaching students the fundamentals of the econometrics domain, the basics of the constituting economics, statistics and mathematics disciplines and academic and research skills. Supporting programme management plans, the panel advises to intensify the students' skills training. In addition, the panel recommends to try and create more opportunities for exchange.

The panel approves of the educational principles and the study methods of the programme, as they foster students achieving the intended learning outcomes. Although the student-to-staff ratio is less favourable in the Dutch track, students and lecturers are positive about the programme's small-scale dimension. The panel welcomes the *Tutor Academy* as an effective means to deploy more teaching capacity.

Programme management has taken important steps to raise the student success rates. The panel regards these to be appropriate. The panel recommends to improve the information provided to the students.

The panel is very positive about the lecturers' research track records. The panel also approves of their educational capabilities, as may be deduced from the proportion of lecturers holding the BKO-certificate.

The panel is positive about the examination and assessment policies and rules and regulations of the Erasmus School of Economics, in force for this and the other programmes of the School. They ensure the validity of the examinations, the reliability of the assessments, the competencies and expertise of examiners and the transparency of the examination processes. The Examination Board works along the lines, as intended by Dutch applicable law. The Board monitors the examination and assessment processes, analyses the examinations and regularly inspects the theses.

The panel approves of the examination methods. The diversity of examination methods in courses and across courses allows for the assessment of both knowledge and skills, relevant to the programme.

The thesis process is satisfactorily organised. This will be further improved, when the *Thesis Workflow System* is implemented. The panel recommends, however, to inform students more clearly and more comprehensively about the thesis process and the thesis assessment. The assessment of the theses is a reliable process, as two examiners are involved and sound assessment forms with relevant assessment criteria are used.

The panel regards the examinations of the courses to be challenging and to definitely meet the courses' learning goals.

The panel studied six theses of students in the programme. These theses are assessed by the panel to be at least satisfactory, while some of these are assessed to be very good. For some of the theses, the panel would have given higher grades than the programme examiners had done. The panel is very content with the quality of the theses and the level achieved by the graduates. In the international track, the proportion of students graduating cum laude is impressive.

The panel assesses the programme Bachelor Econometrics and Operations Research of Erasmus University Rotterdam to be good and recommends NVAO to grant re-accreditation to this programme.

Rotterdam, 6 March 2017

Panel chair
Prof. dr. T.J. Wansbeek

Secretary
drs. W. Vercouteren RC

2. Assessment process

Certiked VBI received a request to conduct a limited programme assessment for the re-accreditation of the academic degree programme Bachelor Econometrics and Operations Research. This request was submitted by Erasmus University Rotterdam.

Certiked requested the approval by NVAO of the proposed panel of experts to conduct this assessment. NVAO have given their approval. The panel composition was as follows (for more detailed information please refer to Annex 4: Assessment panel composition):

- Prof. dr. T.J. Wansbeek, Emeritus Professor of Statistics and Econometrics, University of Groningen (panel chair);
- Prof. dr. J. Hartog, Emeritus Professor of Microeconomics with visiting scholar position, University of Amsterdam (panel member);
- Prof. dr. R. Kabir, Professor and Chair of Corporate Finance and Risk Management, University of Twente (panel member);
- S.M. van den Hoek, student Bachelor programme Tax Economics, University of Amsterdam (student member).

On behalf of Certiked, drs. W. Vercouteren RC was responsible for the process coordination and for drafting the panel's report. All panel members and the secretary signed a statement of independence and confidentiality.

The panel conducted this assessment on the basis of the NVAO Assessment Framework of 19 December 2014 (Staatscourant nr. 36791). Regarding the selection of the theses, the panel proceeded in line with the NVAO Guidelines for the assessment of final projects during external assessments of 18 February 2015. On 19 September 2016, NVAO determined the number of theses to be studied by the panel in this case.

The following procedure was adopted. The panel members of the panel studied the documents presented beforehand by programme management, including a number of theses (please refer to Annex 2 and 3: Documents reviewed and Theses reviewed).

Before the date of the site visit, the panel chair and the panel secretary met to discuss the assessment procedures. On 30 November 2016, the panel had a meeting to discuss the preliminary findings concerning the quality of the programme. Beforehand, the panel members had sent in a number of questions to be put to the programme representatives during the site visit.

During the meeting on 30 November 2016, the findings of the panel members, including those concerning the theses, were discussed. On the basis of the input of the panel, the secretary summarised the questions, which served as a starting point for the discussions with the programme representatives during the site visit.

On 1 December 2016 and on 2 December 2016, the panel conducted the site visit on the Erasmus University Rotterdam campus. The site visit was conducted in accordance with the schedule drawn up beforehand (please refer to Annex 1: Site visit schedule). Prior to the site visit, programme management communicated the open office hours to the students in the programme and the staff. No one called on the panel.

A draft version of this report was finalised by the secretary, having taken into account the information presented as well as the findings and considerations of the panel. The panel members studied the draft report and made a number of changes. Thereupon, the secretary drew up the final report. This report was presented to programme management to be corrected for factual inaccuracies. After having been corrected for these factual inaccuracies, the report was sent to the institution's Board to accompany their request for re-accreditation.

3. Overview of the programme

3.1 Basic information about the programme

Administrative information about the programme:

Name programme in CROHO: Bachelor Econometrics and Operations Research
 Orientation, level programme: Academic Bachelor
 Grade: BSc
 Number of credits: 180.0 EC
 Specialisations: N.A.
 Location: Rotterdam
 Mode of study: Dutch-taught track (full-time, three years)
 International, English-taught track (full-time, three years)
 Registration in CROHO: 56833

Administrative information about the institution:

Name of institution: Erasmus University Rotterdam
 Status of institution: Government-funded university
 Institution's quality assurance: Approved

Quantitative data about the programme

Cumulative proportion of students who dropped out after one, two or three years (vwo matriculation)

Cohort	2009	2010	2011	2012	2013	2014
Drop-out rate after one year	28 %	30 %	38 %	38 %	35 %	41 %
Drop-out rate after two years	35 %	36 %	41 %	39 %	38 %	
Drop-out rate after three years	35 %	37 %	41 %	39 %		

Cumulative proportion of students who continued their study in the second year and who completed the programme after three, four, five and six or more years (vwo matriculation)

Cohort	2009	2010	2011	2012
Success rate after three years	28 %	42 %	41 %	51 %
Success rate after four years	77 %	75 %	80 %	
Success rate after five years	84 %	88 %		
Success rate after six or more years	88 %			

Percentage of students who continued their studies in the second year and who completed the programme after three, four, five and six or more years (all students)

Cohort	2009	2010	2011	2012
Success rate after three years	26 %	41 %	38 %	45 %
Success rate after four years	71 %	76 %	76 %	
Success rate after five years	78 %	88 %		
Success rate after six or more years	84 %			

Lecturers' qualifications

Qualification	MSc	PhD	BKO*
Percentage of lecturers	100 %	76 %	64 %

*BKO means having obtained Dutch University Teaching Qualification. In the figure exemptions are included. Of the lecturers, additional 6 % are in the process of obtaining the BKO-certificate.

The student-to-staff ratio is 44 : 1 for the Dutch track and 26 : 1 for the international track (study year 2015 – 2016).

Number of contact hours per week for each of the years of the programme

Year of the programme	Year 1	Year 2	Year 3
Number of contact hours per week	18	17	6*

*Seminar group supervision hours and individual thesis supervision hours in the third year are not included. As students have many options in the third year, the actual number of contact hours may deviate.

3.2 Main facts about the institution

The degree programme Bachelor Econometrics and Operations Research is a programme of Erasmus School of Economics of Erasmus University Rotterdam.

In its own words, Erasmus University Rotterdam is a research University, with a pronounced social orientation in its education and research. Academics and students at the university are expected to endeavour to solve global social challenges, drawing inspiration from the metropolis Rotterdam. The university spearheads in education and research are health (from molecule to human to society and back), wealth (sustainable economic growth), governance (the organization of companies and society) and culture (happiness and identity in the modern urban society). According to its strategic plan for 2014 – 2018, Erasmus University Rotterdam has set as a goal to strengthen the international impact and relevance of its education and research. The University works together closely with Delft University of Technology and Leiden University.

Erasmus University Rotterdam employs more than 2,700 staff, lecturers as well as support staff. Over 26,000 students study at this University, being composed of more than 16,000 bachelor students and more than 10,000 master students.

Erasmus University Rotterdam is composed of seven faculties, these being Erasmus School of Economics, Erasmus School of Law, Faculty of Social Sciences, Erasmus Medical Centre, Faculty of Philosophy, Erasmus School of History, Culture and Communication and Rotterdam School of Management. In addition, the university includes the Institute of Health Policy & Management, the International Institute of Social Studies and the Institute for Housing and Urban Development Studies.

On the website, Erasmus School of Economics expresses to be an internationally renowned institute that contributes scientific knowledge to future economic issues and aims to answer currently relevant issues of concern to government and firms. The School's focus is on the creation, the dissemination and the application of scientific knowledge, all from an economic perspective. Erasmus School of Economics' portfolio of programmes includes three bachelor programmes, four master programmes, two research master programmes and four postgraduate programmes. The School employs nearly 500 staff, whereas about 4,500 students study at the School.

3.3 Intended learning outcomes

The intended learning outcomes of the programme are as follows.

- Students possess in-depth knowledge of econometrics and mathematical decision-making theory and the core courses of these disciplines and are able to apply the corresponding techniques.
- Students analyse and explain phenomena and issues in the economics of government and business by using their knowledge of the theories and methods of econometrics and operations research.
- Students formulate (business) economic, econometrics or decision-making problem statements based on relevant scientific concepts and theories.
- Students select a research set-up appropriate to the research question.
- Students select or create one or more suitable methods for data collection and analysis.
- Students make statements about the research question based on the results of their research.
- Students propose solutions for economic issues based on relevant concepts and theories from the field of econometrics and operations research.
- Students make connections between the different courses.
- Students select relevant research questions and information from a complex reality and can get to the heart of the matter in a given context.
- Students draw logical conclusions based on the given assumptions.
- Students base statements about reality on reliable data.
- Students use different interpretation frameworks when making statements about reality.
- Students cooperate professionally and effectively in teams, acknowledging each other's interests, position and values.
- Students communicate effectively both in writing and verbally with people and groups of a diverse nature.
- Students show themselves to be responsible, academically trained professionals who have the learning skills to engage in a continued degree programme that assumes a high level of autonomy.

3.4 Outline of the curriculum

In the table below, the programme curriculum is presented.

Courses	Credits
Take-Off	0.0 EC
Introduction to Analysis	6.0 EC
Introduction to Statistics	6.0 EC
Matrix Algebra	6.0 EC
Microeconomics	6.0 EC
Analysis	6.0 EC
Macroeconomics	6.0 EC
Guidance	0.0 EC
Probability Theory	4.0 EC
Introduction to Programming	4.0 EC
Vector Calculus	4.0 EC
Statistics	4.0 EC
Linear Programming	4.0 EC
Mathematical Methods	4.0 EC
First year	60.0 EC
Combinatorial Optimisation	4.0 EC
Advanced Statistics	4.0 EC
Programming	4.0 EC
Nonlinear Optimisation	4.0 EC
Finance 1	8.0 EC
Marketing Research	4.0 EC
Econometrics 1	4.0 EC
Markov Processes	4.0 EC
Econometrics 2	4.0 EC
Numerical Methods	4.0 EC
Simulation	4.0 EC
Time Series Analysis	4.0 EC
Introductory Seminar Case Studies Econometrics and Operations Research	8.0 EC
Second year	60.0 EC
Minor (12.0/15.0 EC) or Internship (12.0 EC) and Electives (12.0/9.0 EC) or Exchange (24.0 EC)	24.0 EC
Mathematical Economics	4.0 EC
Major courses (2 x 4.0 EC)	8.0 EC
Major Seminar	12.0 EC
Philosophy of Economics	4.0 EC
Bachelor Thesis	8.0 EC
Third year	60.0 EC
Total credits of the programme	180.0 EC

4. Overview of assessments

Standard	Assessment
Standard 1. Intended learning outcomes	Satisfactory
Standard 2: Teaching-learning environment	Good
Standard 3: Assessment	Satisfactory
Standard 4: Achieved learning outcomes	Good
Programme	Good

5. Findings, considerations and assessments per standard

5.1 Standard 1: Intended learning outcomes

The intended learning outcomes of the programme have been concretised with regard to contents, level and orientation; they meet international requirements.

Findings

In preparation of this external assessment, the Erasmus School of Economics in collaboration with the management of the economics programmes of Vrije Universiteit Amsterdam and Wageningen University updated the domain-specific reference framework for economics. The current reference framework is an update on a number of non-essential points of the 2009 edition, which was approved by the Deans of all Economics Faculties in the Netherlands. The major change has been the removal of sections referring to business administration.

The programme is offered in two separate tracks, the Dutch track and the international track. In terms of intended learning outcomes and curriculum contents and structure, these tracks are identical. The main difference is the language of instruction, this being Dutch, obviously, in the Dutch track and English in the international track. In the third year, the programme is offered only in English.

Students may choose the Bachelor Econometrics and Operations Research as it is or may take the double degree programme, offered by Erasmus School of Economics. This double degree programme allows students to complete this bachelor programme and the Bachelor Economics and Business Economics programme in parallel within four years.

The objectives of the programme are to prepare students for one of the subsequent master specialisations in the econometrics discipline or to train them for junior positions in the labour market. Most students tend to opt for continuing their studies at master level. The programme is meant to train students to become all-round econometricians, having a thorough knowledge base in economics, mathematics and statistics and knowing how to model economic phenomena and trends and to solve economic problems through the application of mathematical and statistical methods and techniques. The programme offers four major specialisations in the third year, giving students the opportunity to select the specialisation of their preference and allowing them to prepare for the master specialisation of their choice. These major specialisations are *Business Analytics and Quantitative Marketing*, *Econometrics*, *Quantitative Finance* and *Quantitative Logistics*.

Programme management drafted the programme intended learning outcomes. These learning outcomes specify disciplinary knowledge and understanding of econometrics and mathematical decision-making, research skills, analytical and problem-solving skills and professional skills, such as collaborative and communication skills and students' professional attitude. Disciplinary knowledge and understanding are to be achieved by students at the basic level for the econometrics domain in a broad sense and at the more advanced level for the major specialisation students have chosen.

Programme management drafted a table, to show the correspondence of the intended learning outcomes of the programme to the Dublin-descriptors for bachelor programmes. From this table may be deduced the programme intended learning outcomes match these Dublin-descriptors.

For the Erasmus School of Economics master programmes, Advisory Boards with representatives of the professional field have been installed. These Advisory Boards are asked for advice on the intended learning outcomes and the curricula of these programmes. Recommendations on their part filter through via Erasmus School of Economics programme management to this bachelor programme and may affect the learning outcomes and the curriculum of this programme.

Considerations

The panel welcomes the efforts of Erasmus School of Economics and of the economics programmes of Vrije Universiteit Amsterdam and of Wageningen University to draft the update of the 2009 domain-specific reference framework.

The panel supports the objectives of the programme, to train students thoroughly in econometrics and the constituting disciplines of economics, mathematics and statistics and in the application of mathematical and statistical methods and techniques to model economic reality and solve economic problems. The panel is positive about the programme being offered in two separate tracks, allowing students to either be educated in Dutch or to opt for the international, English-taught programme. The panel also welcomes the major specialisations, allowing students to prepare for either one of the master specialisations of Erasmus School of Economics or one of the programmes of other institutions.

The panel studied the intended learning outcomes of the programme and observes these to meet the programme objectives, exhibiting, among others, disciplinary knowledge and understanding of econometrics and mathematical decision-making, research competencies, analytical and problem-solving skills and professional skills. In the panel's opinion, the programme learning outcomes are consistent with the domain-specific reference framework. The panel considers the intended learning outcomes of the programme to adequately prepare students for master programmes in this domain as well as to prepare them for junior positions in the labour market.

The panel ascertains the intended learning outcomes of the programme to match the Dublin-descriptors for bachelor programmes and, therefore, to meet the requirements of a bachelor level programme.

The panel feels the involvement of the professional field through the Advisory Boards of the Erasmus School of Economics master programmes is satisfactory, as Erasmus School of Economics programme management will direct relevant recommendations to this bachelor programme.

Assessment of this standard

These considerations have led the assessment panel to assess standard 1, *Intended learning outcomes* to be satisfactory.

5.2 Standard 2: Teaching-learning environment

The curriculum, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes.

Findings

The responsibility for all of the programmes of the Erasmus School of Economics rests with the Dean of the School. The Vice Dean is the programme director of all of these programmes. Consequently, the quality of all of the programmes of the School is his responsibility. For each of the bachelor programmes, the bachelor coordinator monitors the processes of these programmes. The master coordinator takes care of the organisation of all of the master programmes. Academic directors are responsible for the curriculum and the teaching in the master specialisations. Programme management, being the programme director, the bachelor coordinators and the master coordinator, meet very regularly to discuss the organisation and the processes of the programmes. The academic directors meet to discuss the contents of the master specialisations. In each of the bachelor and master programmes, an Educational Committee, being composed of an equal number of lecturers and students, advises programme management on the programme quality. For all of the School's programmes, an Examination Board has the responsibility to monitor the examinations' and assessments' quality.

The number of students enrolling in the Dutch track of the programme grew substantially over the last six years, going from an influx of 154 students in 2011 to an influx of 243 students in 2016. The number of students enrolling in the international track rose from an influx of 41 students in 2012 to an influx of 53 in 2016. In addition, 58 students started in 2016 in the double degree programme Economics and Econometrics. All students taken together, the growth in the number of incoming students was drastic, going from an influx of 154 students in 2011 to an influx of 354 students in 2016. The number of Dutch and foreign students in the international track is balanced for educational reasons. Dutch students are to pass a selection procedure to enrol in this track.

The entry requirements for applicants are the Dutch *vwo-diploma*, with the required level of mathematics (Mathematics B). Students without Mathematics B have to pass a deficiency test, before being admitted. Foreign students should have an equivalent diploma and should be proficient in English. In case of doubt about the mathematical skills, these students have to pass the deficiency test as well. Applicants have to do the study check to see whether they would fit the programme requirements and may succeed in the programme. Mathematical skills are checked, as they are considered to be an important determinant for study success.

Programme management presented tables in which the relations between the intended learning outcomes and the curriculum components for all of the major specialisations have been specified. From these tables, it may be deduced that for each of the major specialisations all of the intended learning outcomes are addressed in one or more courses.

The first two years of the curriculum are the same for all the students. In these years, students are taught the basic knowledge of mathematics, statistics, microeconomics and macroeconomics. In addition, students are offered training in computer programming and in building mathematical models. In the course *Introductory Seminar Case Studies Econometrics and Operations Research*, students are introduced to the third year major specialisations, as they are taught to address three distinct practical economic problems, to mathematically model these problems and to present their findings. In the first part of the third year, students either take a minor or internship and electives or participate in an international exchange programme. In the second part, students take their major specialisation, which is composed of two specialisation courses (each 4.0 EC) and a seminar (12.0 EC). The specialisations prepare for the master specialisations and have been listed under standard 1. In the seminar, students are taught to apply knowledge to practical problems. At the end of the third year, students complete their bachelor thesis, usually addressing a topic, related to their specialisation. The students with whom the panel met, expressed being very positive about the contents of the curriculum, describing it as providing a strong foundation in the econometrics domain.

The coherence of the curriculum in the first year and the second year is discussed on a regular basis by the bachelor coordinator and the lecturers, whereas the curriculum coherence in the third year is a topic for discussion between the major specialisations coordinators and the major thesis coordinators. In the curriculum, five teaching-learning chains may be detected, being mathematics, statistics, economics, programming and operations research chains. In their meeting with the panel during the site visit, the students expressed being positive about the coherence of the curriculum.

The educational principle of the programme is mainly directed towards enabling students to achieve the intended learning outcomes. Study methods are plenary lectures, tutorials and exercise lecturers. The subject matter of the courses is presented in the plenary lectures, whereupon in the tutorials, students are taught aspects of the course subjects more in-depth. In the exercise lecturers, students are practically trained in doing specific exercises and assignments. In the plenary lectures of the Dutch track, the groups of students may be relatively large, whereas the tutorials and exercise lecturers are much more small-scale. In the third-year seminars, the groups are equally small and students work intensively on real-life assignments. The student-to-staff ratio in the Dutch track is 44 : 1 and in the international track, it is 26 : 1. The students with whom the panel met, regarded the tutorials, exercise lecturers and seminars to ensure small-scale teaching in the programme. The number of contact hours is 17 and 18 hours per week in the first two years and 6 hours per week in the third year. The programme director explained Erasmus School of Economics to be experimenting with new study methods, such as MOOC's. Implementation of these methods has just started.

Programme management has taken a number of measures to foster the students' study pace and to raise the student success rates. In the study check procedures, the mathematical skills of prospective students are thoroughly screened. In the first year, students should report 60.0 EC. This measure, being a major change in recent years at Erasmus University Rotterdam, is not so much meant to lower the drop-out rates but more to encourage good students to collect all the credits of the first year. In some cases, students may compensate fails, provided the grades are at least 4.5. If students fail to collect 60.0 EC, they will have to leave the programme. The proportion of students completing the programme in three years increased from 26 % to 45 %, whereas the figure for completion in four years went up from 71 % to 76 % (figures for last three or four cohorts). Erasmus School of Economics has set the target 75 % of the students to graduate within four years.

Lecturers are appointed at one of Erasmus School of Economics departments, being the Departments of Applied Economics, Business Economics, Econometrics or Economics. Lecturers are to qualify for one of the research institutes of the School. The panel studied the list of publications by staff members, lecturing in the programme. Lecturers are to demonstrate their skills in education by obtaining the BKO-certificate. Lecturers may have an exemption, if they have been rated 3.5 on a 5-point scale in student evaluations of five separate courses. Course evaluations are part of the annual lecturers' performance interviews. Of the lecturers, 76 % have obtained a PhD, whereas 64 % are in possession of the BKO-certificate or have been exempt. Another 6 % of the lecturers are in the process of obtaining this certificate.

To accommodate growing student numbers, while maintaining small-scale teaching, 5.0 FTE additional staff have been recruited in the context of the so-called *Tutor Academy*, primarily to select and train a substantial number of student-assistants as tutors.

Considerations

In the panel's view, the admission requirements and the admission processes, such as the study check procedures, are adequate for this programme. The emphasis on mathematical knowledge and skills is appropriate, this being for this programme a very relevant predictor for study success.

The curriculum reflects all of the intended learning outcomes of the programme adequately and evenly. The panel considers the curriculum to be very well designed and effective in teaching students the fundamentals and the principles of the econometrics domain, the constituting economics, statistics and mathematics disciplines and academic and research skills. The panel approves of the curriculum coherence. The students are positive about the curriculum contents and coherence. In support of the programme management's intentions, the panel recommends to intensify the students' skills training, including study skills and academic writing and presentation skills, as these appear to be somewhat underrepresented in the curriculum. In addition, the panel advises to try and offer more opportunities for international exchange for students.

The panel approves of the educational principles and the study methods of the programme, as they foster the students achieving the intended learning outcomes. Although the student-to-staff ratio in the Dutch track is less favourable, students and lecturers expressed being positive about the small-scale dimension of the programme. The panel welcomes the *Tutor Academy* as an effective means to deploy more teaching capacity in the programme.

Programme management has taken important steps to raise the student success rates. The panel regards the success rates to be appropriate. The panel recommends to improve the information provided to the students. The School uses various platforms (Blackboard, Sin-online, Osiris) for the communication, which is not very transparent for students.

The panel finds the research records of the lecturers impressive, as may, among others, be deduced from the list of their publications. In addition, the panel approves of the lecturers' educational capabilities. The proportion of lecturers holding the BKO-certificate is quite substantial.

Assessment of this standard

These considerations have led the assessment panel to assess standard 2, *Teaching-learning environment* to be good.

5.3 Standard 3: Assessment

The programme has an adequate assessment system in place.

Findings

The examinations and assessments of this programme, as of all the other programmes of the Erasmus School of Economics, are governed by the Erasmus School of Economics Examination Policy. This Examination Policy provides the framework for the examinations and assessments for each of the bachelor and master programmes of the School. In addition, the Examination Board publishes each academic year the Rules and Regulations for the examinations and assessments. These may deviate on certain points from the Rules and Regulations of the previous year. The examination regulations and procedures are very similar, if not identical for all of the programmes of the School.

For all the programmes of the Erasmus School of Economics, one single Examination Board has been installed. The Examination Board works in accordance with applicable Dutch law. The Board, among others, assures the quality of examinations and assessments, appoints examiners, grants exemptions, handles cases of fraud, advises on the Teaching and Examination Regulations and ensures programmes complying with these Regulations.

In the context of the Examination Policy of the School and the Rules and Regulations of the Examination Board, a number of measures have been taken by programme management to ensure the validity of examinations, the reliability of assessments and the transparency of the examination processes. To enhance the validity of the examinations, each of the examinations is prepared by one of the lecturers and is presented to another lecturer for review. On recommendation by the management of the various programmes, the Examination Board appoints the examiners for the course examinations and for the thesis assessments. The examiners meet specific requirements, set by the Examination Board. In the case of master theses, one of the examiners should hold a PhD. The results of each of the examinations in the School are analysed. Should the pass rate be outside of the 50 % – 90 % range, the Examination Board will inspect the examination more closely to check the reliability of the assessment. Every year, the Examination Board inspects about 40 theses from this and other programmes of Erasmus School of Economics to verify if these meet the requirements set and have been assessed in a correct way. The grades of the theses in the sample range from 5.5 to 7.0 and 9.0 and more. About eight members of the Board are involved, covering the various sub-disciplines of the programmes. If the Examination Board finds one or more of the theses unsatisfactory, these will be discussed with the director of the department and through him or her with the examiners. To promote the transparency of the examinations, students are informed about the assessment criteria of the courses, are provided with model examinations and may inspect the grading of their work.

Examination methods include written examinations with open questions, mid-term tests, oral examinations, individual and group assignments and presentations. In the econometrics courses, no multiple-choice examinations are used to test the students' knowledge. In most of the courses, multiple examinations are to be taken by the students and the final grade of the courses is a composite grade, this being the weighed outcome of the grades of the course components.

At the end of the programme, students are required to complete their thesis. For each of the major specialisations as well as for each of the master specialisations, a thesis manual has been drafted by the thesis coordinator of the department or section involved. Students are entitled to guidance during the thesis writing process by a supervisor, being a lecturer in the programme. The Erasmus School of Economics is in the process of implementing the *Thesis Workflow System*. This system has already been implemented in the master programmes of the School. The bachelor programmes will follow in the coming years. This system is an ICT-system, allowing to monitor the thesis writing process and the thesis assessment process more consistently and in a more organised way. The thesis proposal is to be approved by the thesis supervisor, before the student can start writing the thesis. The student needs to present drafts of the thesis to be discussed with the supervisor. In the Thesis Workflow System, the supervisor may check more easily the progress of the student and his meeting the requirements in the process, such as uploading the approved proposal. The students with whom the panel met, were not very content with the information about the thesis process and the thesis assessment.

Theses are assessed by both the thesis supervisor and the second assessor. The assessment criteria for the thesis are the same across the major specialisations in the bachelor programmes and for the master specialisations, taking the difference in level into account, obviously. These criteria are to be assessed using a Likert-scale, ranging from unsatisfactory to excellent. The supervisor assesses the thesis process, including the degree of independent work on the part of the student and assesses the report. The second assessor only assesses the written report. These two examiners review and grade the thesis independently and meet to arrive at the final grade. The bachelor thesis process may be concluded with an interview of the student by the two examiners. In the master programmes, an oral defence of the thesis by the student is mandatory. With the implementation of the Thesis Workflow System, the two examiners assessing the thesis independently is ensured better than before. Theses are checked for plagiarism and plagiarism scores are mentioned on the assessment form.

Considerations

The panel approves of the examination and assessment policies and rules and regulations of the Erasmus School of Economics, in force for this and the other programmes of the School. They ensure the validity of the examinations, the reliability of the assessments, the competencies and expertise of examiners and the transparency of the examination processes.

The panel considers the Examination Board to have the responsibilities and to work along the lines as intended by Dutch applicable law. The Board monitors the examination and assessment processes, analyses the examinations and regularly inspects the theses.

The panel approves of the examination methods, programme management has selected. The diversity of examination methods in courses and across courses allows for the assessment of both knowledge and skills, relevant to the programme.

In the panel's view, the thesis process is satisfactorily organised. This will be further improved, when the Thesis Workflow System is implemented. The assessment of the theses is a reliable process, as two examiners are involved and sound assessment forms with relevant assessment criteria are used. The panel recommends to inform students more clearly and more comprehensively about the processes of thesis supervision and assessment. In addition, the panel advises considering using weighted criteria in the thesis assessment.

Assessment of this standard

The considerations have led the assessment panel to assess standard 3, Assessment to be satisfactory.

5.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Findings

In the year 2014 – 2015, the average grade for the bachelor theses as estimations for the learning outcomes achieved by the graduates, was 7.7 in the Dutch track and 7.8 in the international track. In the international track, the proportion of students graduating cum laude was no less than 27 %.

As has been mentioned when discussing standard 1, most of the graduates of the programme do not enter the labour market, but proceed with their studies at master level. This proportion is more than 83 % of the graduates. The majority of the graduates continue their studies at Erasmus School of Economics master programmes.

Considerations

The panel studied the examinations of a number of courses in the programme. The panel establishes these examinations to be of adequate quality and of an appropriate level. The examinations are considered by the panel to be challenging and well elaborated and to definitely meet the courses' learning goals. As the panel observed, students will have achieved the programme intended learning outcomes, if they have passed all of these examinations.

The panel studied six theses of students in the programme. These theses are assessed by the panel to be at least satisfactory, while some of these are assessed to be very good. For some of the theses, the panel would have given higher grades than the programme examiners had done. The panel is very content with the quality of the theses and the level achieved by the graduates, as may be deduced from the grades given and from the assessment by the panel of these grades being sometimes too low. In the international track, the proportion of students graduating cum laude is impressive.

Assessment of this standard

The considerations have led the assessment panel to assess standard 4, Achieved learning outcomes to be good.

6. Recommendations

In this report, a number of recommendations have been listed. For the sake of clarity, these are brought together below. The recommendations are the following.

- To intensify the students' skills training in the curriculum, in support of the plans of programme management.
- To try and offer students more opportunities for international exchange.
- To improve the information provided to the students by aligning the different communication platforms.
- To inform students more clearly and more comprehensively about the thesis process and the thesis assessment.
- To consider using weighted criteria in the thesis assessments.

Annex 1: Site visit schedule

The site visit was conducted in Rotterdam on 1 December 2016 and on 2 December 2016.

Site visit schedule for 1 December 2016.

08.30 h. – 09.00 h.	Arrival and deliberations panel (closed session)
09.00 h. – 09.45 h.	Board Prof. dr. Ph.H.B.F. Franses (Dean Erasmus School of Economics), prof. dr. I.J.M. Arnold (Vice Dean Erasmus School of Economics, programme director), W. Rowaan MA (senior policy adviser Education Erasmus School of Economics)
09.45 h. – 10.45 h.	Programme management/core lecturers Bachelor Economics and Business Economics Programme management/core lecturers Master Economics and Business Dr. B. Hoogendoorn (bachelor coordinator, Bachelor), dr. N.L. van der Sar (lecturer, Bachelor), dr. J. Delfgaauw (academic director Economics and Organisation track, Master), prof. dr. K.I.M. Rohde (academic director Behavioural Economics track, Master), prof. dr. J.T.J. Smit (academic director Financial Economics track, Master), prof. dr. T.G.M. van Ourti (academic director Health Economics track, Master)
11.00 h. – 11.45 h.	Lecturers/thesis examiners Bachelor Economics and Business Economics Lecturers/thesis examiners Master Economics and Business Dr. B. Karreman (lecturer/thesis examiner, Bachelor/Master), dr. V. Volosovych (lecturer/thesis examiner, member Education Committee, Bachelor/Master), dr. B.S.Y. Crutzen (lecturer/thesis examiner, Bachelor), dr. S.H. Bijkerk (lecturer/thesis examiner, Bachelor/Master), dr. A.C. Gielen (lecturer/thesis examiner, Bachelor/Master), dr. E.M. Bosker (lecturer/thesis examiner Bachelor/Master), dr. V.G. Hariharan (lecturer/thesis examiner, Bachelor/Master)
11.45 h. – 12.30 h.	Students and alumni Bachelor Economics and Business Economics Students and alumni Master Economics and Business D. Vodegel (student, member Education Committee, Dutch track, Bachelor), D.O. Anshah (student, member Education Committee, international track, Bachelor), R.T. van den Oord BSc (alumnus), T. Koning BSc (student, Master), M.A.J. van Hulsen BSc (student, Master), A.M.R. Woodend MSc (alumna), T. Reijnen MSc (alumnus)
12.30 h. – 13.30 h.	Lunch panel (closed session), open office hours 12.30 h. – 13.00 h.
13.30 h. – 14.30 h.	Programme management/core lecturers Bachelor Econometrics and Operations Research Programme management/core lecturers Master Econometrics and Management Science Dr. H.J.W.G. Kole (bachelor coordinator, Bachelor), prof. dr. D.J.C. van Dijk (academic director Quantitative Finance track, Master), prof. dr. A.P.M. Wagelmans (lecturer Operations Research and Quantitative Logistics track, Master), prof. dr. D. Fok (academic director Business Analytics Quantitative Marketing track, Master), prof. dr. R. Paap (academic director Econometrics track, Master)

- 14.30 h. – 15.15 h. Lecturers/thesis examiners Bachelor Econometrics and Operations Research
Lecturers/thesis examiners Master Econometrics and Management Science
Dr. C. Heij (lecturer/thesis examiner, chair Education Committee, Bachelor), dr. W. van den Heuvel (lecturer/thesis examiner, member Education Committee, Bachelor/Master), prof. dr. P.J.F. Groenen (lecturer/thesis examiner, Bachelor/Master), dr. R. Spliet (lecturer/thesis examiner, member Education Committee, Bachelor/Master), dr. M. van de Velden (lecturer/thesis examiner, Bachelor/Master), dr. E. Oldenkamp-Bazsa (lecturer/thesis examiner, Bachelor)
- 15.30 h. – 16.15 h. Students and alumni Bachelor Econometrics and Operations Research
Students and alumni Master Econometrics and Management Science
T.T. Wiemann (student, member Education Committee, international track, Bachelor), L. Li (student, Dutch track, Bachelor), M.T. Graftiaux (student, international track, Bachelor), M. van Breugel BSc (student, member Education Committee, Master), H.S. Doytchinova BSc (student, Master), L.W. Maassen MSc (alumnus), O.R. Pidenko MSc (alumna)
- 16.15 h. – 17.45 h. Deliberations panel (closed session)
- Site visit schedule for 2 December 2016.
- 09.00 h. – 10.00 h. Examination Board, all programmes
Prof. dr. J.M.A. Viaene (chair Examination Board), prof. dr. A. Dur (vice-chair Examination Board), drs. V.H.M. Beerkens (secretary Examination Board), K. Goudzwaard-Noot MSc (secretary Examination Board)
- 15.30 h. – 15.45 h. Board (second meeting)
Prof. dr. Ph.H.B.F. Franses (Dean Erasmus School of Economics)
- 15.45 h. – 17.00 h. Deliberations panel (closed session)
- 17.00 h. – 17.30 h. Main findings presented by panel chair to Dean and programme management

Annex 2: Documents reviewed

The panel studied the following documents, presented prior to the site visit

- Self-Assessment Report Bachelor Econometrics and Operations Research
- Areas and actions for improvement
- Domain-specific reference framework
- Matrix Dublin descriptors and intended learning outcomes
- Relation intended learning outcomes and curriculum
- Overview of curriculum
- Organisational structure of programme
- Overview teaching staff
- List of theses 2014 – 2015 and 2015 – 2016
- Teaching and Examination Regulations
- Annual Report of Examination Board
- Erasmus School of Economics Education Statistics
- Publication List Erasmus School of Economics

Prior to the site visit, panel members were given access electronically to course manuals and course material

On the day of the site visit, programme management presented the following documents

- Course material of a number of selected courses of the programme
- Examinations of a number of selected courses of the programme
- Programme Committee reports
- Examination analyses

Annex 3: Theses reviewed

The theses of the following six students have been selected for review by the panel.

- 389273
- 369570
- 376793
- 380056
- 362843
- 388401

Annex 4: Assessment panel composition

The assessment panel had the following composition:

- Prof. dr. T.J. Wansbeek, Emeritus Professor of Statistics and Econometrics, University of Groningen (panel chair);
- Prof. dr. J. Hartog, Emeritus Professor of Microeconomics with visiting scholar position, University of Amsterdam (panel member);
- Prof. dr. R. Kabir, Professor and Chair of Corporate Finance and Risk Management, University of Twente (panel member);
- S.M. van den Hoek, student Bachelor programme Tax Economics, University of Amsterdam (student member).

Prof. dr. T.J. Wansbeek, panel chair

Mr. Wansbeek is Emeritus Professor of Statistics and Econometrics at University of Groningen. He took his doctorate from University of Leiden. Among others, he held positions as Professor of Microeconomics at University of Amsterdam, as the Dean of the Faculty of Economics and Business of University of Amsterdam and as the Dean of the Faculty of Economics of University of Groningen. He was and is an editorial board member of a series of academic journals, such as *Journal of Econometrics*. Mr. Wansbeek held and holds a number of visiting scholar positions at, among others, University of Southern California, United States and Zhejiang University, China.

Prof. dr. J. Hartog, panel member

Mr. Hartog is Emeritus Professor of Microeconomics at University of Amsterdam, holding a visiting scholar position at this university. He took his doctorate from Erasmus University Rotterdam. At this university, he held the position of researcher and associate professor, subsequently becoming Professor of Microeconomics at University of Amsterdam. He held a number of visiting positions at universities in countries Europe, the United States and Asia. He also was an editor and referee for a number of international academic journals. Mr. Hartog is a member of the Royal Netherlands Academy of Sciences.

Prof. dr. R. Kabir, panel member

Mr. Kabir is Professor and Chair of Corporate Finance and Risk Management at University of Twente and Head of the Department of Finance and Accounting. He took his doctorate from Maastricht University. He held visiting scholar positions at, among others, Central University of Finance and Economics, Beijing, China, New York University, United States and University of Melbourne, Australia. Before becoming Professor at University of Twente, Mr. Kabir was Associate Professor of Finance at Tilburg University and Professor of Finance at University of Stirling, United Kingdom.

S.M. van den Hoek, student member

Ms. Van den Hoek is a student in the Bachelor programme Tax Economics of University of Amsterdam. She has taken on a number of extra-curricular activities, such as being the chair of the Student Association of her programme and being a member and the chair of the Student Council of the Faculty of Economics and Business of University of Amsterdam. In addition, Ms. Van den Hoek is employed by Canal Company as a guide and a host.